THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXII. No. 806.] LONDON, OCTOBER 22, 1878. [30th Year.] Price 6d.

COOKE BROS.

See Page 613.

26, 27, & 28, FENCHURCH ST.,

LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.

Several Prize Medals. Established over 20 Years.

These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.

The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.

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BROOKFIELD GAS APPARATUS WORKS,
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CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.

JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,

Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.

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Established at the commencement of Gas Lighting,
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TUBES AND FITTINGS.
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LICENSEES AND MANUFACTURERS OF
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STREET-LAMPS, &c., &c.

Established 1830.

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And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.

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ESTIMATES FREE
FOR MAIN-LAYING AND GENERAL REPAIRS
RETORT-SETTING A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS guaranteed to carbonise a large amount of coal with a small per cent. of fuel.

N.B.—All kinds of Fire Goods, &c., kept in stock for immediate delivery. Orders promptly attended to.

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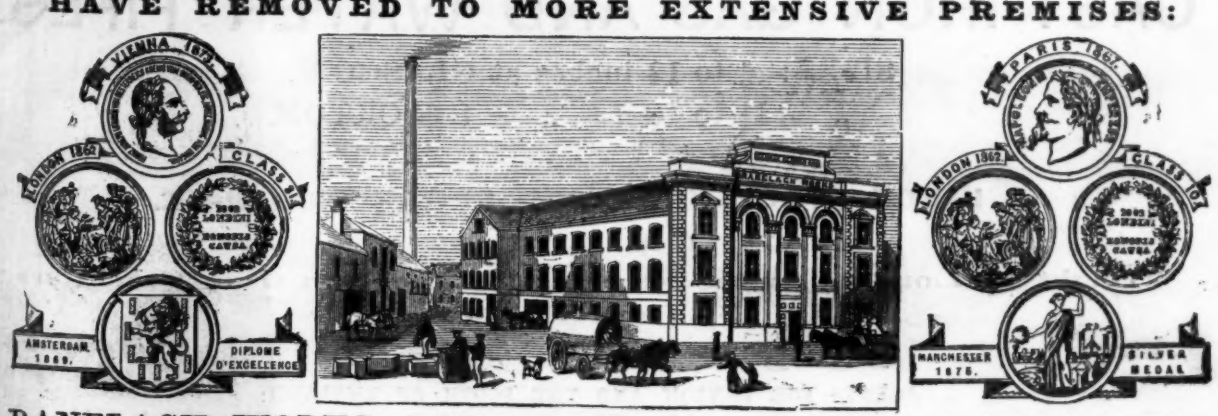
CHANGE OF ADDRESS.

GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

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Now ready, GAS CHANDELIER BOOK (Reduced Prices), 7s. 6d.

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IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

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IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

And all kinds of Experimental Gas Apparatus.

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SIZES: ¾ to 12 inches at GLASGOW.
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Freight to London, in the Stream, 10s. per ton from Stockton; 15s. from Glasgow.

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HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

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Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at the Beckton Gas-Works.

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Sixteen now in course of erection at Beckton, applied to Covers 30 feet square.

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WEST'S GAS IMPROVEMENT COMPANY,

LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

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WILLEY & COMPANY,

GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

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OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

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JOHN WM. O'NEILL, Managing Director.

THE

STANDARD WASHER AND SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

Some of the advantages claimed for this Apparatus are as follow:—

The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.
Unerring Regularity in the Distribution of the Liquor.
Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.
Economy of Space, thus enabling the Apparatus to be protected from the Weather.
Economy of First Cost and of Maintenance.
It works without Pressure.
It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

Applications for Prices, &c., to be made to

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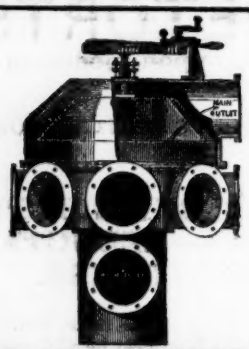
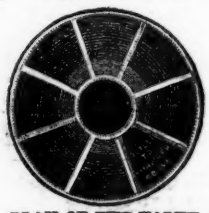
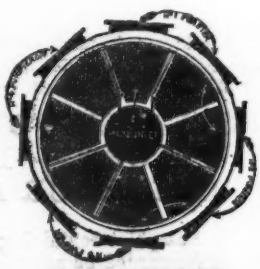
C. & W. WALKERS'
PATENT CENTRE-VALVES.



ELEVATION OF THE CENTRE-VALVE.



PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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EDWARD COCKEY & SONS,
GAS ENGINEERS, FROME SELWOOD,

MANUFACTURERS OF ALL DESCRIPTIONS OF

APPARATUS CONNECTED WITH GAS-WORKS.

THE ORIGINAL PATENTEES AND MANUFACTURERS OF THE

DRY-FACED VALVES

FOR PURIFIERS, GASHOLDERS, BYE-PASS, AND OTHER ARRANGEMENTS REQUIRING VALVES IN GAS-WORKS.

The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

They are more easily repaired than any other kind of Valve in use, and can be re-ground in a few hours without removal, and made perfectly gas-tight.

References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

MANUFACTURERS ALSO OF SUPERIOR WOOD GRIDS FOR PURIFIERS, SCRUBBERS, &c.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

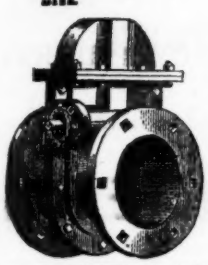
LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

B. DONKIN & CO.'S

IMPROVED GAS-VALVES

WITH WROUGHT-IRON PINIONS.



List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.

These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

ALSO SOLE MAKERS OF

J. BEALE'S NEW PATENT GAS EXHAUSTERS,

AND MAKERS OF

STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,
VALVES FOR AMMONIACAL LIQUOR,
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BYE-PASS VALVES, SCREW WATER-VALVES, &c.

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GAS ENGINEERS,

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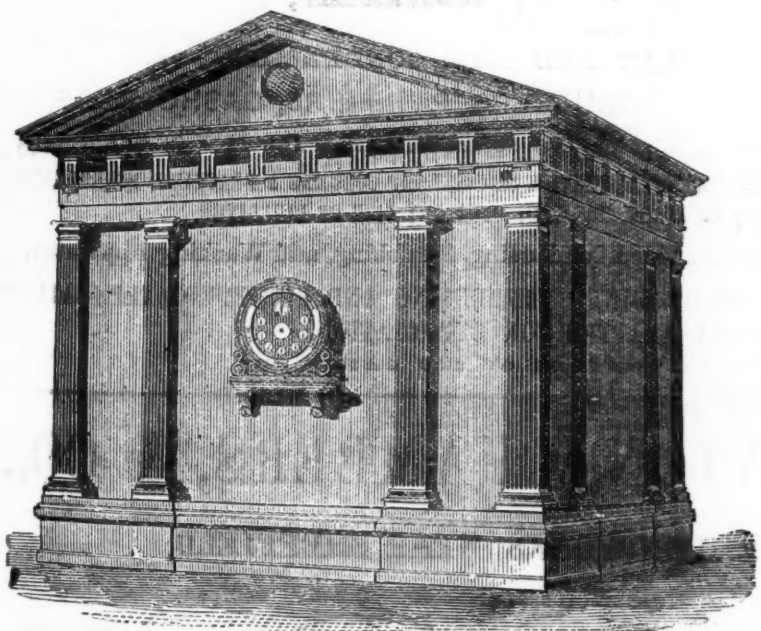
ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c. ON APPLICATION.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,
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DEMPSTER & SONS'

RENOWNED

WOOD SIEVES,

WITH TAPER BARS,

MADE BY MACHINERY

CAPABLE OF MAKING 10,000 PERT WEEKLY.

References to Hundreds of First-Class Engineers.

ROSE MOUNT IRON-WORKS,
ELLAND, NEAR HALIFAX.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

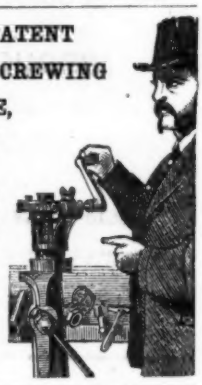
GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,



For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

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MANUFACTURERS OF

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STEEL OF ALL DESCRIPTIONS,

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RATCHET BRACES, LIFTING-JACKS,
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The following Medals have been awarded:—

GRAND COUNCIL MEDAL, LONDON, 1851. | MEDAL, LONDON, 1862.

GOLD MEDAL, PARIS, 1867,

The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners

MEDAL FOR PROGRESS, VIENNA, 1873.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes;

TIN TUBES;

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BRACKETS FOR HEATING AND LIGHTING;

METALLIC BEDSTEADS.

Ecclesiastical and Mediæval Metal Workers.

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W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD,

MANUFACTURERS OF

RETORTS, ANNULAR AND PIPE CONDENSERS,

WROUGHT AND CAST IRON SCRUBBERS, PURIFIERS, GASHOLDERS,

GOVERNORS, AND ALL THE NECESSARY FITTINGS FOR COMPLETING THE ERECTION OF GAS-WORKS.

STATION & CONSUMERS WET OR DRY METERS, STREET & SERVICE MAINS, LAMP COLUMNS & BRACKETS, & WROUGHT-IRON TUBES AND FITTINGS; WROUGHT-IRON ROOFS FOR ANY SIZE OF BUILDINGS.

Sole Makers of B. W. Thurston's Combined Condensing, Scrubbing, and Washing Apparatus,

AND PATENTEES OF THE IMPROVED COMBINED CONDENSING AND PURIFYING APPARATUS SO EMINENTLY ADAPTED FOR EXPORTATION.

REFERENCES TO UPWARDS OF 300 GAS-WORKS.

MESSRS. NEWTON, CHAMBERS, & CO.,

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MANUFACTURERS OF

IMPROVED CENTRE-VALVES,

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

TANGYE BROTHERS AND HOLMAN,

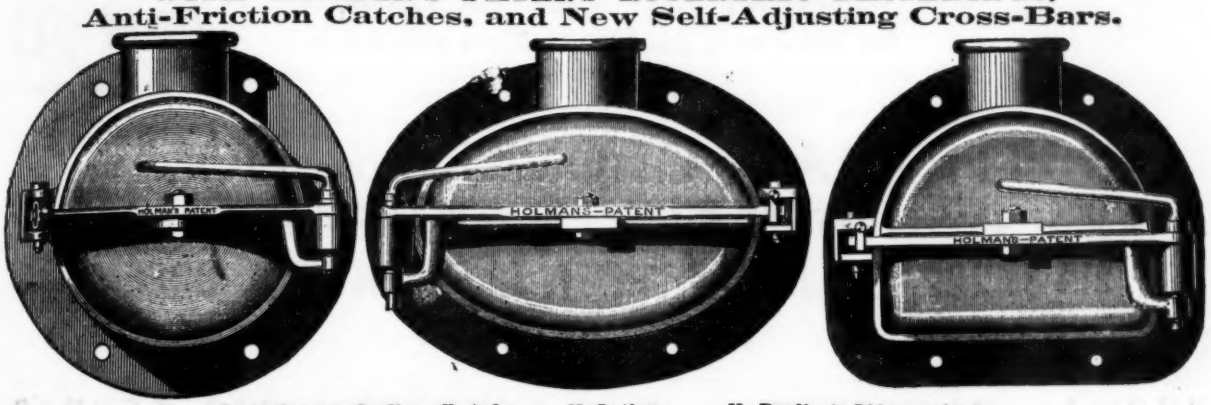
CORNWALL HOUSE, 35, VICTORIA ST., LONDON, E.C.

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.

And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

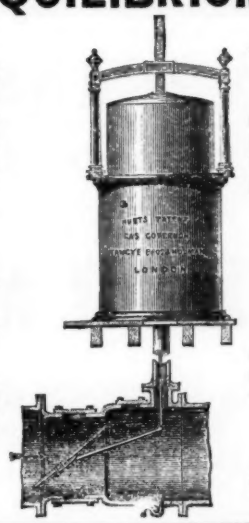
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1878.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

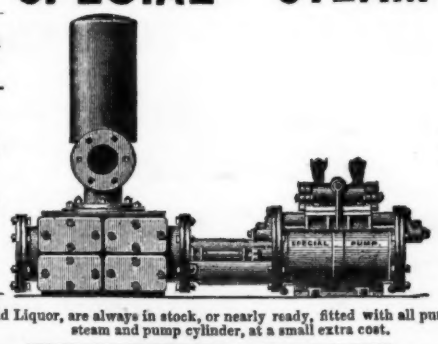
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
6	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

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London, 1851 New York. 1853. Paris, 1855. London. 1862.

Dublin, 1865.

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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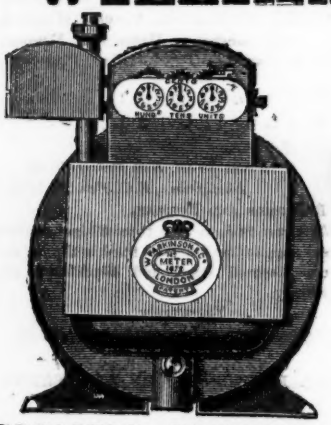
THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



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WET & DRY METERS,

STATION-METERS & GOVERNORS,

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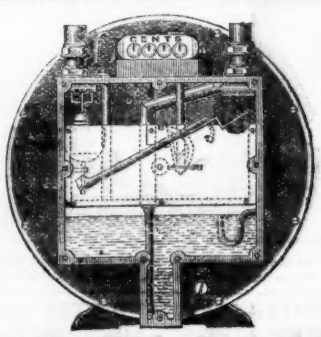
PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

Until arrangements, consequent upon the recent death of Mr. William B. King, are made, all communications for the Editor, remittances and orders for subscriptions and advertisements, &c., should be addressed to Walter King, 11, Bolt Court, Fleet Street, London, E.C.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 22, 1878.

Circular to Gas Companies.

The market for gas shares is evidently improving. When we say this, it must be understood that we have a strong opinion—indeed, we know—that little, if any, business has been done at the low prices which have been quoted. Shrewd people who, after reading their morning papers, went into the City with the idea of making a good investment—and Chartered A stock at 145 would be a good investment—found themselves disappointed when they got to the broker's office. The stock was not forthcoming, at all events at that price, and little was to be had at any price. The scare has been principally on paper. That Shareholders have been alarmed is not to be concealed, but their fright has not carried them to the folly of parting with their property. When the half-yearly accounts of the Metropolitan Gas Companies are again made up, we expect it will be found that not much more than the usual amount has been realized by transfer fees.

The electric light will, no doubt, soon receive a somewhat extensive trial in the Metropolis. The Metropolitan Board of Works have determined to experiment on the Victoria Embankment, and probably on Waterloo Bridge. The Court of Common Council have also determined on making some experiments in the streets, and in Billingsgate Market. The former authority appear to have entered into some engagement with the Société Générale d'Electricité, who propose to introduce the Jablochkoff system. The Société are, however, just now under a cloud. They are accused of having appropriated the magneto-electric machine of Mr. Wilde, of Manchester, which they have been using in Paris and have recently brought to London, without the consent of the proprietor. Its introduction has been resisted, and, at the present moment, an interim injunction hangs over the head of the Société. This little difficulty, however, can easily be surmounted, and, moreover, there are other machines besides Mr. Wilde's. We do not regard the Embankment as the best line which could have been selected for the experiment, and we venture to predict a failure. Waterloo Bridge is far better calculated to display the light, but even there we feel satisfied that anything but economy will result from the installation of the new illuminating agent.

Three Companies have been registered whose object is to promote the use of the electric light. It would be useless to disguise the fact that two of these are very powerfully supported. The British Electric Light Company have among their first subscribers Sir C. T. Bright and Mr. Latimer Clarke, two of the most prominent electric telegraphists of the day. Whether they will succeed in making as much progress in the use of electricity for illuminating purposes as they have for telegraphy remains to be seen.

The Electric Lighting Company, promoted by Mr. John Hollingshead, looks financially very strong, but no names of any scientific importance appear among the first subscribers. The scope of this Company is rather wide. Their object is to promote the use of electricity for the production of light wherever illumination is required; they propose also to apply it as a heating agent, and as a producer of motive force. There is also a suggestion that they intend to take up the telephone and Mr. Edison's other electrical inventions.

There is another, called the Sun Company, the promoter of which appears to be Mr. C. W. Harrison, who brought out the Air Gas Company some years since. It would be singular if this gentleman were not mixed up with schemes for some new illuminating agent. We notice that an experiment with electric lighting is to be made at the Crystal Palace. Shall we have the opportunity of witnessing a repetition of an exhibition we saw there once before?

The London Gas and Water Companies, for some reason which is not altogether unintelligible to us, stand aloof from the Gas and Water Companies Association. It is clear that in view of the continued supply of a new illuminating agent, Gas Companies must prepare themselves for possible eventualities. Legislation will be necessary; but the form it will take can only be settled by a public department. The step which the Gas and Water Companies Association propose seems to be a sensible one. Granted that the electric light must be supplied as an auxiliary to gas, who are so well circumstanced to supply that light as the Gas Companies? They have, as matters stand at present, the right to break up streets—it does not matter whether it is to lay down pipes or to lay down wires; the single authority they require is the power to use patented inventions for the supply of an illuminating agent other than that produced by the distillation of coal. This power the Association wish to obtain by a general Act, and we are sorry to see that they are not supported by the Metropolitan Gas Companies.

It is impossible to read all that is written about the electric light. This is the "silly season," and the daily papers should be infinitely grateful to the correspondents who fill their columns with contributions on the subject. "Impelled by inexorable "fate," it is our duty to read as many of the communications as mortal minds can bear; but we are compelled to renounce the attempt to read one-half the letters and articles which inundate the Metropolitan and Provincial Press. If this were not, as we have said, the "silly season," we should be puzzled to account for the excitement which now prevails. An invention has been made which is being gradually developed. Rumour, as usual, outruns fact, and people are alarmed as the figure passes by. In sober truth, setting aside Mr. Edison's reported discovery, very little has been done to make the electric light generally available as an illuminating agent, and the mass of printed paper, relating to the subject, which lies before us, furnishes us with no substantial information as to the possibility of a further advance. That progress will be made, we may take as certain; but why should Gas Shareholders be alarmed? If they are stupid enough to sell at reduced prices, they will find a ready market for their property. People are waiting to invest in gas securities which

will pay a good interest. A wealthy man said last week in our hearing that he would put £10,000 into gas shares to pay him from six or seven per cent., but at the present time he could not get them.

In another column will be found the report of Mr. Bassingham, of the Commission of Sewers, who went to Paris, and has furnished his colleagues with an account of all he saw and heard there respecting the new light. As a matter of course, he admits its brilliancy; but, while noticing the natural appearance it gave to the colours of fabrics at the Magasins du Louvre, he observed that it was not favourable to the complexion. It gives, as he says, "a ghastly appearance," which is just what the actresses say. Mr. Bassingham is rather strong in figures, and makes out that the cost of the electric light is, in some instances, eight hundred per cent. above the cost of gas. At this rate, of course, little will be done, except in the way of experimentation. The new light is certain to receive a trial in the City.

Lieut.-Col. Haywood, C.E., has been to Paris, as we said last week, and has presented to the Commissioners a very able report, for which we hope to find space in next issue. He expresses some doubt as to its economy, except under peculiar circumstances, but recommends that a trial should be made in some of the City thoroughfares and public spaces. The first he selects is the Holborn Viaduct, which, we are inclined to think, is a very suitable locality in which to make the experiment. It possesses obvious recommendations, not the least of which is the subways, which will carry the wires, and in the neighbourhood of which the engines could, no doubt, be placed. As said above, we consider straight, level thoroughfares like Waterloo Bridge and the Viaduct, to be the best places for making a trial of the light. We say this because we do not wish to see it turn out a failure, but, on the contrary, shall welcome it as a success. It will make no difference to the Gas Companies, who earn very little by lighting Waterloo Bridge or the Viaduct; but it may make some to the wayfarers, as, towards the small hours, they wend their way home. After these, we may take it, gas will again resume its sway, and, as in Paris, if a man be not at home before midnight, he will have to find his way to his residence by gas light.

One result that Lieut.-Col. Haywood expects to follow from the introduction of the new light is the cheapening of gas, which he thinks will be reduced to 2s. 6d. per thousand cubic feet—a price which he considers will put gas in a fair position to compete successfully with electricity, even for public illumination. As regards domestic illumination, we have said over and over again, and need hardly repeat here, that we have not the least fear of competition.

If the electric scare has done nothing worse, it has apparently frightened the Corporation of Liverpool out of the notion of purchasing the undertaking of the Gas Company. The special Gas Committee, who were appointed under the auspices of Dr. Cross about two years ago, have been dissolved, it being considered they had no longer a *raison d'être*. If we remember rightly, the tremendous report against the Company that Dr. Cross threatened has never appeared. At all events, the equanimity of the Shareholders of the Gas Company has been but little disturbed. The worst thing that has happened to them has been a further payment of £17,000 to the Mersey Dock Board, which completes the amount due for the destruction of the landing-stage. Certainly, the Liverpool Gas Company have not felt the advantages of carrying on the gas-fitting business, and they have very properly transferred that branch of their operations to an independent Company. The case, however, is hardly to be quoted against Companies doing their own fittings. The destruction of the landing-stage was the result of gross stupidity, and a little presence of mind would have saved the structure.

We referred last week to the able address delivered by Mr. Hepworth, on opening the meeting of the North of England Association of Gas Managers. It was hardly necessary for him to defend the existence of such Associations, for every one must agree that they are of the utmost utility. They serve, as it was well put, to keep Managers up with the progress made in their art. They promote social intercourse—a thing in itself of no small value. We are pleased to see Mr. Hepworth supporting the movement for the improved education of Gas Managers, and advocating the claims of the British Association to take the lead in the matter. The examinations of the Society of Arts, excellent in their way, are scarcely what is wanted for a Gas Manager. We must have something more special and definite, and this can only be arranged by those who are thoroughly well acquainted with all the various duties of a Gas Manager. With what Mr. Hepworth says concerning the electric light we perfectly concur; but, as the matter has been referred to at some length above, we need not further notice it. We may mention here that the meeting was in every way a complete success. The paper read by Mr. Ford was of much technical interest, and was thoroughly appreciated by the members. We quite agree with Mr. Sellers, of York, that it would be to the advantage of Gas Companies to undertake the gas-fitting business, and carry the gas to the very point of combustion. It has been many times said in these columns that most of the complaints which are made of bad gas are caused by imperfect fittings. Mr. Pattinson's comparative experiments with Wright's, the Referees, and what he designates the Letheby sulphur test, are, except as regards the latter, of interest. It must be said, however, that the apparatus used was not that employed by Dr. Letheby, and all the results obtained by its use may be entirely disregarded. We are somewhat surprised to find the results obtained by Wright's apparatus coming so near those procured by the Referees. The Newcastle Gas Company are perfectly justified in continuing the use of the former. Why Newcastle gas contains so little sulphur is a very important question, and we are sorry that Mr. Pattinson did not devote some words to an account of the modes of purification followed. We shall wait with impatience for the paper in which he promises to treat of this subject.

The gas consumers of Standish are very discontented with the Corporation of Wigan, who, it is alleged, supply a gas at too high a pressure, and of too low an illuminating power; charge too much, and appropriate the profits to the improvement of the town of Wigan. There are perhaps some foundation for these complaints, of which we shall probably soon hear more. If what is said about excessive pressure be true, it is clear a district governor might be used with advantage and profit.

It is said to be doubtful whether the Corporation of Limerick will be able to raise the money to enable them to complete the purchase of the Limerick Gas Company's works. The reason assigned is that the electric light has scared people, who are afraid the profits of the undertaking will not allow of the payment of any interest. We can hardly believe the statement, but it must be admitted that the credit of the Corporation of Limerick does not stand high. The Corporation have been recommended to shirk the purchase, but the advice, we think, comes too late. The Limerick Gas Company are doomed to extinction.

Water and Sanitary Notes.

THERE was on Friday last a rather animated discussion at the Metropolitan Board of Works, when the report of the Works and General Purposes Committee, who had considered Mr. Selway's motion, was brought up. The Committee, after what must have been something of a lively scene, had come to, we consider, the wise decision, of doing nothing respecting the purchase of the Water Companies, and the institution of a new water supply, until they had ascertained the views of the Government on the matter. This was regarded by some members as very puerile policy, and they wished the Board to plunge at once into the course which cost the unfortunate ratepayers so much money last year. Happily the independent course taken by some members of the Board has so far saved the public purse. The Board will do nothing until they have ascertained the views of Her Majesty's Government, and we venture to predict that they will do nothing at all. The London Water Companies are unassailable. They perform their duties to the public with wonderful exactness, and, if they occasionally fail to furnish water of the quality which *doctrinaire* Examiners require, it is hardly to be considered their fault. One may go all round the kingdom, and it will be found that no Company or Corporation supply water of such even quality, and with so much regularity, as the London Water Companies. What would result if the Metropolitan Board obtained the undertakings we will not venture to predict; but we do not hesitate to express an opinion that, just as has happened in a variety of other instances, the supply in the hands of the Metropolitan Board would be just the same; in fact, it could not be otherwise. The new hard supply would be the work of a quarter of a century, and long before that time had elapsed the Board would be in the limbo of forgotten entities. We, of course, take no notice of the personalities which were indulged in last Friday. They do not add to the credit of the Board, who, when such a question as this was under discussion, should have observed the most perfect decorum. We favour neither party. Only the fullest consideration of the possible advantages or disadvantages which might result to the Metropolis from the adoption of the Board's scheme would justify the further plunder of the Metropolitan ratepayers. We may take it that the discussion will be resumed at a future meeting of the Board, when we shall, no doubt, obtain a clearer insight into the views entertained by a majority of the members. At

present it is refreshing to see that a consideration for the ratepayers is springing up.

The Town Council of Derby have resolved on promoting a Bill in Parliament for effecting a compulsory purchase of the Derby Water-Works Company. We expect that they will be strenuously opposed. Derby has been extremely well served by the Company, and we have never heard any complaints as to the quality or quantity of the supply. The Company, in fact, in some respects, stand in an exceptional position. Every inhabitant of Derby, we believe, with the exception of a few ambitious members of the Town Council, is perfectly contented with them. A vigorous fight must result, unless some compromise be effected, and at the present moment it is not clear how this can be done. We are afraid that the contest will be fought out to the bitter end, and we know very well who will suffer. The ratepayers may be said to have the matter entirely in their own hands. If they, at the town's meeting which must be called, will refuse their sanction for the promotion of a Bill which will not in the least advance their interests, the ambitious members of the Town Council will be foiled.

How to dispose of the sewage of Glasgow has long puzzled the Town Council of that city. They have had from Sir John Hawkshaw much advice, which they have never taken, and now they have adopted the report of Mr. Bateman, who recommends them to construct a sewer or sewers to carry the sewage to Dalmuir, and there subject it to some precipitation process. The clear water will then be run into the Clyde, and subsequently the sludge will be barged away, and dropped into Loch Long. This plan is hardly one which will be entirely approved of by outsiders. The precipitation part of the process most will commend; but the desecration of Loch Long, by shooting into it the sewage sludge of Glasgow, we believe all will condemn.

Many men, including ourselves, are sometimes doubtful whether or not self-government can be exercised, say with benefit to a community, by certain individuals. The Town Council of Honiton at present offer the lamentable spectacle of an elected body utterly incompetent to understand the wants, and to apply a remedy for the evils of which their constituents complain. In all our experience we know nothing more disgraceful than their conduct. That more than three of the present members should be permitted to sit in the Council after the coming elections is to be greatly deplored. Our readers know that we are the earnest advocates of self-government; but it is perfectly clear that the ratepayers of Honiton have not the sense to select men competent to manage local affairs. For once we are glad that a Central Authority exist, and earnestly hope that the Local Government Board will exercise their full powers at Honiton.

Mr. H. Law, M. Inst. C.E., at the recent meeting of the Sanitary Institute at Stafford, called attention to the principle which should determine the boundaries of drainage districts. Disregarding altogether what may be called at present the political boundaries, we wish to see what Mr. Law advocates—viz., "to follow the natural watershed areas of the country." This plan has been advocated in the JOURNAL for many years, and we have repeatedly shown how, by a simple study of the Ordnance map, it may be cheaply carried out. Until a complete drainage scheme shall be developed on some such principle as Mr. Law advocates, we shall be left with the piecemeal system which now lands Local Authorities into difficulties and needless expenses.

LINCOLN GAS COMPANY.—The half-yearly meeting of this Company was held on Wednesday, the 9th inst.—Alderman Brogden in the chair. The usual statutory dividends were declared, the retiring Directors (Messrs. J. Foster, J. Hall, and G. R. Trafford) and the Auditor (Mr. C. Wilks) were re-elected, and the ordinary business was transacted. The Chairman alluded to the apprehensions entertained by some shareholders that the electric light would, in some respects, supersede the use of gas. He said the invention, at present, was in a very crude state, but, even if it were perfected, he was of opinion no harm would result to gas property.

OPENING OF WATER-WORKS AT MELKSHAM.—In the last session of Parliament the Trowbridge Water Company obtained an Act empowering them, among other things, to extend their limits of supply to Melksham. Promptly acting on the powers thus obtained, the Company erected the necessary works, and on Thursday, the 10th inst., amidst great local rejoicings, the water supply was inaugurated. A large fountain, surrounded by rock work, dotted with ferns, was erected in the Market Place, and in the circumference at the base, which measured 100 feet, were the words, traced out in marble pebbles, "Success to the Water Supply of Melksham." A raised dais near, covered with sailcloth on account of the doubtful weather, was set apart for the opening ceremony. On the sides were these mottoes, on shields: "Pure water is health," "Pure water is wealth." The whole of this work was designed and well executed by Messrs. F. Cheverill and J. Silcocks, officials in the Company's service, at Trowbridge. All preliminaries being arranged, Mr. Henry Tomlison, the Engineer of Company (who is also Engineer and Manager of the Cambridge University and Town Water-Works Company), presented Mrs. Lopes with a T-key covered in rich dark velvet, with golden tassels at the ends, and with it she turned on the first jet of water, amidst deafening cheers, the stream sparkling in the air, and eliciting repeated cheers. A luncheon in the Town Hall followed.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE COST OF COAL AND THE PRICE OF GAS.

SIR,—I think some gas managers, for reasons needless to mention, will thank Messrs. Jones and Woodall for their controversy upon the "Cost of Coal and the Price of Gas."

In that controversy, one item of cost affecting the selling price of gas, say, at Leeds, has not been touched upon, and that is, the cost of the large amount of coal which must be used to feed the 16 per cent. of waste sustained in the distribution of gas in that town. Mr. Woodall gives the loss as no less than 2·34d. per 1000 cubic feet. The enclosed analysis,* drawn up by the Accountant of the Bingley Improvement Commissioners, shows the loss here to be 0·96d. per 1000 cubic feet, or 1·38d. less than that at Leeds. If to this loss (much in excess of the average) be added the loss for extra wages to stokers, purifiers, and coalers, the loss for extra fuel, lime, and retorts, *plus* the interest and the sum required for sinking-fund upon the enlarged plant from the mouthpiece onwards to the gasholder, surely a "mischievous" state of affairs exists, which much more requires correction than the so-called "erroneous opinion" of those who firmly believe that the "selling price of gas is mainly dependent on the price of coal."

At the risk of being somewhat censorious, I am inclined to say that if this rich mine were well worked, the result would confer a more substantial benefit upon the Leeds Corporation than do reports which, however much they may tickle the varying intelligences of his Gas Committee, do not leave the impress of accuracy on men necessarily more acquainted with these matters than are the members of most Corporation Gas Committees.

It would be worth knowing how many additional thousands of pounds sterling are paid per annum for the coal, the gas from which is lost at Leeds, in consequence of the excessive leakage prevailing there.

Gas-Works, Bingley, Oct. 12, 1878. GEORGE DUNBAR MALAM.

IRVINE WATER-WORKS.

SIR,—We notice in your issue of yesterday a paragraph about the Irvine Water-Works, stating that the works have been handed over by us to the Water Commissioners, and that already there are serious complaints of leakage at the filters.

This report is quite inaccurate. The works are under trial, and they will not be handed over to the Commissioners till August, 1879, the end of the Contractors term of maintenance. As to the leakage, it is only some 4 gallons per minute over 6000 square yards of water surface, and is simply due to a little soakage through the brickwork, which we always find to be the case at first. We satisfied the Committee at our late visit that there was nothing serious, and we trust you will give the same publicity to our report to them as you have given to this paragraph.

Whoever is your correspondent at Irvine is either very inaccurate, or is actuated by some feeling, as we had occasion once before to correct a paragraph in your paper about these works. J. AND A. LESLIE.

72A, *George Street, Edinburgh,*
Oct. 16, 1878.

[The paragraph referred to above, appeared in "Trade Notes from Scotland" supplied by "Our own Correspondent" for whose statements we do not hold ourselves at all responsible.—ED. J. G. L.]

ACCOUNTS OF GAS COMPANIES.

SIR,—I have pleasure in forwarding you a copy of the statement of accounts of the Chepstow Gas Company, of which I beg your acceptance, as a contribution upon the question as to the proper form of presenting gas-works accounts, and as representing the working of a small gas company.

If you think proper to publish it as an item in the JOURNAL, I may be allowed to suggest that the only portion which can be of any interest is the statement of accounts, pure and simple. WILLIAM DORÉ.

Chepstow, Oct. 11, 1878.

[The accounts referred to above will be found on page 600.—ED. J. G. L.]

DISTURBANCE OF GAS-MAINS THROUGH COLLIERY OPERATIONS.

SIR,—Can you, or any of your readers, inform me if a gas company can recover compensation under the following circumstances:—

A colliery proprietor, by working under a public road, and also under an old railway now used as a road, has caused subsidences, whereby the gas-mains laid along the road and railway have become damaged and broken. The gas company acquired by their Act power to lay mains along the railway as well as in the road. If an action lies against the colliery owner, can the company recover for loss by leakage (ascertained from comparisons with corresponding periods of previous years), as well as for the expenses incurred in repairing the mains? Mineral districts will, no doubt, furnish a precedent. B.

Oct. 17, 1878.

NORTH OF ENGLAND GAS MANAGERS ASSOCIATION.

SIR,—Kindly permit me to correct an error in your report of what I said at the meeting of the North of England Gas Managers Association in relation to Scotch cannel gas.

Instead of "from 40 to 20 and 22 candles," read, "30 to 20 and 22 candles." The ordinary use of coal gas, possessing an illuminating power of 40 standard sperm candles, has never been known to me, and it is quite evident that the same area of pipes would not serve for the 20-candle gas as for gas of 30-candle quality.

My pertinent question (as Mr. Sellers termed it) was this—seeing that architects provided amply, by the specification of ¾-inch and ½-inch pipes, for the passage of 30-candle gas, say, ten years ago, how could they be expected to know that ½-inch and ¾-inch pipes would be required now?

This being so, I (from a consumer's point of view) maintain that the

See page 601.

consumer is hardly dealt with in being obliged to conform to this levelling down process, and thereby put to the expense of substituting pipes of increased area.

My argument had no direct reference to Mr. Sellers's paper, except in so far as to bring out his opinion of the seeming injustice of such a case towards the gas consumer.

D. M. Nelson.

Glasgow, Oct. 18, 1878.

THE ELECTRIC LIGHT.

Sir,—The present unnecessary panic amongst gas shareholders induces me to add a few words to those I have already published upon the electric light. After a remarkably complete investigation, continued from the year 1802 to the year 1807, Sir Humphry (then Mr.) Davy delivered his celebrated Bakerian Lecture upon electricity to the Royal Society, and, amongst other still more astonishing results, displayed and explained the so-called novelty of the present day—the electric light; and those who will take the trouble to peruse that lecture, as published in the Transactions of the Royal Society, will, I am sure, be greatly surprised to find how very little has since been added to the electrical discoveries of Sir H. Davy.

I will here describe one of Sir H. Davy's experiments, because it hinges upon a difficulty said to have been lately overcome as a recent discovery altogether; this is the regulation of electrical currents. Sir Humphry fixed a platinum wire, about 6 inches in length, between the two poles of a voltaic battery, the wire being of such a thickness that it just became red hot throughout its whole length by the action of the battery. In this state he applied the flame of a spirit-lamp to one end of the wire, so as to make it white hot, and thus, by expanding that part of the wire, he separated the metallic molecules from each other, and, therefore, diminished the conductive power. The consequence was that the rest of the wire ceased to be red hot, because the electrical current was diminished. He then removed the lamp and the whole of the wire became again red hot. He next applied a piece of ice where he had put the lamp, and the rest of the wire became directly white hot. He ultimately showed that, even by blowing with the breath upon part of the wire, he so cooled it that the rest became white hot in consequence of the increased conductive power caused by the current of cold air. This last fact is of importance to the present argument, because amongst the novelties is a plan for regulating the electric current, by passing it over a thin metallic band placed horizontally between two fixed points, and having in its centre a weight, which is to rise or fall according to the heat of the band resulting from the electric current, and this motion of the weight is to regulate the flow of electricity, very much as Mr. Alfred King's governor regulates the flow of gas. But from Sir H. Davy's experiment we see that even a breath of air would cool the metallic band, and cause the electric light to "flare up;" and even if the band were enclosed and protected from currents, this would not protect it from the changing coldness of the atmosphere due to thermometric and hygroscopic causes; therefore, this novelty will, no doubt, prove a failure. Another plan, having the same object, is said to be by compression upon an imperfect conductor, so that, by approximating its molecules, to vary its conductive power, exactly as Sir H. Davy, by separating the molecules of platinum, varied the conductive power of his wire. But it is to be noticed that the molecules of platinum returned of themselves to their original position upon the removal of the exciting cause, and it has yet to be shown that any imperfect electrical conductor exists which, after compression by force, will resume exactly its original condition when that force is withdrawn. Most certainly lamp-black will not do this, for, like sawdust, it may be compressed into a solid block. If, however, we imagine this difficulty overcome, where are we as regards domestic use? Every house, nay, every lamp must have its own regulator to turn on and off at pleasure, and does any sane person believe that silly servant girls and ignorant footmen are qualified for such a task as that? The answer might be given by *Punch*, and I can just fancy a cartoon representing John Thomas and Mary Jane turning on the electric light, and electrifying themselves much more than the dining-room. But the truth is, this panic is an attempt to get gas companies to take up the electric light, and I hope the attempt will fail, as I am sure the light will fail, in a domestic sense.

I do, however, think that gas directors have something yet to do. Dividends of 10 and 12 per cent. are dangerous things; they foster competition and create a notion of monopoly, than which nothing is more objectionable to a free trading people. A 6 or 7 per cent. dividend is much safer. Then, again, the gas-coke is now sold in lumps, four or five of which will fill one of the small fireplaces put into the houses of the poorer classes, but, when so placed, the lumps will not burn because they expose a small surface for combustion and permit currents of cold air to rush between them. If broken to the size of walnuts, gas-coke will burn freely in such fireplaces, and when thus broken and delivered into the houses of the poor at 3d. per bushel, it would be a blessing for the poor, and something very like it for the gas companies also.

Oct. 19, 1878. Lewis Thompson.

Sir,—I read daily, and with increasing interest, the leaders, articles, and correspondence appearing in the newspapers as to the electric light, and I notice, in your issue of the 15th inst., Mr. William Livesey states "that it has been arranged to convene a deputation of the Companies to wait on the Board of Trade to obtain powers to supply the electric light."

Before convening such a deputation, would it not be better to form a committee of our leading gas engineers, to ascertain, by practical experiments, the best means of increasing the illuminating power of gas? Such a course, I think, would find greater favour in the eyes of shareholders, seeing that something like £100,000,000 is computed to be invested in gas interests in the United Kingdom; and it seems to me that some effort should at once be made by directors to compete with the new light, and the only way, in my opinion, would be to cheapen gas, and increase its illuminating power.

Consumers are at present, and justly so, dissatisfied with the gas with which they are supplied, and their cry is naturally for "more light." The electric light supplies something above the wants of the general public, and, although it will doubtless be a formidable rival to coal gas, the means of utilizing it for general lighting purposes are not yet fully discovered, and therefore, whilst it is still in its infancy, and gas companies pay large dividends, would it not be politic on their part to adopt those means which lie within their power to give us a better gas, by using cannel more extensively, as was suggested by Dr. William Wallace, in his report presented to the British Association which recently met in Dublin? Hitherto the cost of cannel has been such, that it has only been used (except in towns near the cannel pits) under exceptional circumstances, such as accidents in the gas-works, bad coal, or the advent of the authorized examiner. Now, it is my opinion that the opening up of the West Yorkshire cannel-fields shows us the way out of the difficulty as to the great expense of using cannel; for I am informed, on good authority, that this cannel can be had at 50 per cent. less than Scotch cannel, whilst its results show 25 candles when burnt in a Sugg's No. 7 steatite bat's-wing burner; and each ton of coal yields, in practical working, not less than 10,500 cubic feet of gas, with over 13 cwt. of coke suitable for household purposes. One objection of the cheap cannels to many is, that the residuals are not so valuable as those of gas coal; but I am assured that with these cannels the results are in favour of them.

As to the supply of West Yorkshire cannels, I am at the present moment unable to give a correct estimate of the extent of these seams. I believe they have only been worked some few years, but are being rapidly developed, and are capable of yielding a supply equal to any demand which may be made upon them for many years to come. Such being the case, I think that gas companies have in their own hands the means of giving us a light much superior to that we have at present, and equal to all requirements for manufacturing, house, and street lighting purposes. The superiority of cannel gas over common gas is instanced in the better street lighting of Glasgow, as compared with that of London. The cost of cannel is now so small, that gas companies should not hesitate to give their customers the full benefit of the lighting power it produces, at a very small extra cost to them. In fact, in the face of the increasing popularity of the electric light, directors of gas companies should lose no time in improving the illuminating power of gas, by giving us 25 instead of 14-candle gas, or it seems probable that this new light may entirely supersede our present mode of lighting, and, consequently, affect a large portion of the community who are shareholders.

I trust the ventilation of this subject in your columns may draw the attention of the gas world to the valuable information given in Dr. Wallace's report, and published in your issue of the 17th ult., and that shortly it may lead to some practical results.

London, Oct. 17, 1878. G. T. A.

Sir,—The panic in gas shares is to be deprecated, not on account of losses which may accrue to those who desire to get rid, at any sacrifice, of their holdings, but in the interest of others, who with calmer judgment, may yet be forced to sell out from circumstances over which they can exercise no control.

Even assuming that everything which has been attributed to Mr. Edison's supposed discovery should turn out to be true—which, however, is certainly not probable—still, to effect any serious supercession of gas, the new light must offer decided advantages of some kind in order to counterbalance to the public the expense and trouble of the change. It must, in short, be cheaper, better, and more convenient than gas. Are these conditions likely to be fulfilled? To begin with—Is it likely to be cheaper?

In replying to this, so far as we at present know, we can only proceed by comparing with the *probable* cost of electricity, the *actual* cost of gas.

This we may divide under three heads, viz.—

1. Cost of coal or fuel.
2. Interest or dividend on capital.
3. Labour, supervision, repairs, taxes, and general expenditure.

Under these three headings are contained all the expenditure of gas companies, and each in its proportion contributes to form the price at which the light is sold.

From such an imperfect idea as can at present be formed of the probable *modus operandi* to be employed in the distribution of the electrical current for lighting purposes, we can only conjecture what the cost of plant is likely to be. Still, we know that finished machinery of this kind is expensive; that the number of machines will necessarily be considerable; and that they must be large and powerful. We also know that some means of conveying the wires to the houses to be lighted must be arranged; and that, as over-head wires are found to be dangerous, this means, must necessarily be by underground pipes, much in the same way that gas is now conveyed. Capital must, therefore, be largely expended, and to perform an equal amount of work we do not anticipate that it will be less than that now employed by the gas companies. Interest or dividend, therefore, will, under the new system, form an equal charge against the consumer of light to that with which he is at present burdened; and I may add that, so far as can in the meantime be calculated, a not less expenditure is probable under labour and general charges than that which is now found necessary.

We find ourselves, therefore, thrown back on a comparison of the cost of coal and other materials required to make and purify gas, as against the probable fuel account in the generation of electricity.

The net cost of the materials thus used in the manufacture of gas in London is 6d. to 7d. per 1000 cubic feet, equivalent at 16-candle gas to 3200-candles illuminating power. The cost of a 1200-candle light by electricity has been given as 4d. per hour. Such at least is the estimate published of the reduced light to be applied at the Stereoscopic Company's establishment in Regent Street, and, as the engine fuel, in a previous statement of charge, is set down at 1d. per horse power per hour, it is evident that *only the fuel expenditure* has been entertained in this estimate.

The cost is thus equal to 10s. 8d. for light equal to that produced from 1000 feet of gas, or almost double what, if gas were employed, the same amount of light could be obtained for. This, besides, is in a concentrated form, exceedingly favourable to the electricity—the proportion of cost being admittedly higher when the light is divided.

In the report published in the *New York Sun*, Mr. Edison is said to

have stated 15 cents as the probable cost of a light equal to 1000 cubic feet of gas; but it is evident that even that low estimate cannot compete with the figure at which London Companies can at present manufacture.

Again, will the new light be better, or, as a whole, more suitable to the wants of the community than that which is now in use? I think not. More brilliant, perhaps, it may be; but this brilliance, being excessive, will be hurtful to the eyes, and even if toned down to meet individual requirements in this respect, the yellow ray from gas light will remain a less injurious centre of light than the white ray emitted by electricity. The heat from our gas-burners is appreciably useful in saving household fuel, and the product of combustion—carbonic acid—is identical with the exhalation of our lungs, both being due to be removed by ventilation, which, by the way I may here observe, receives, in ordinary circumstances, too little of our attention.

Gas light may be diminished or turned full on; with electricity, I understand, we must either have a full light or nothing. Gas light, under any circumstances, must be more reliable, as an accident to the engine would put a district lighted by electricity in total darkness. Finally, the necessary shifting of the carbon or other candles, even if the present interval of three hours should be extended to a week, will be as prohibitive as the renewal of the wick is under the old oil-lamp system.

The electric light may find its place in street lighting if the price is not prohibitive. It is not, however, I think, adapted for theatres or places of public amusement. In these cases, the heat and suffocating gases complained of really proceed from the bodies and lungs of the crowded audience, and the heat of the gaslight, whether from a sun burner or otherwise, ascends with the draught it causes, ventilating and renovating the atmosphere of the place which would otherwise become suffocating and unendurable.

Hoping in this way to contribute towards a due appreciation by those interested in gas stock of their relative strength, and consequently towards the allaying of what I consider unnecessary apprehension of disaster.

A. F. Wilson.

34, *St. George's Road, S.E., Oct.* 19, 1878.

THE PANIC IN GAS SHARES.

Sir,—I venture to suggest to timorous holders of shares in gas companies (either London or provincial) that, before they recklessly sacrifice their valuable property, they should carefully consider the following objections (*inter alia*) to the adoption of the electric light for ordinary domestic consumption, which, granting all that Mr. Edison says to be true, must still be fatal to it.

1. The electric light, or its producer, cannot be stored up in a reservoir like a gasholder, so as to be capable of being turned on when required.

2. A domiciliary visit would be required each day by a skilled workman—at once a serious item of expense; as well as a nuisance.

3. Many stations would be required for the motive power necessary to produce it, and the cost of these in England generally, and in London particularly, would amount to a fabulous sum.

4. As gas in New York, and, indeed, in all American cities, is much dearer than in England, it is reasonable to conclude that the electric light will be universally adopted there, if so much less expensive, and we may with reason wait to see the result.

5. I am one of those who believe that the cost of producing gas may and will be greatly reduced, and that the value of gas shares will not suffer a permanent reduction.

M. B. Jackson.

Cheltenham, Oct. 18, 1878.

THE PUBLIC AND THE GAS COMPANIES.

Public (exultingly)—
You're bothered and worried,
And fearfully flurried,
Respecting Electric Light,
When eating or drinking,
You cease not from thinking
Is *Edison* really right?

Gas Company (calmly)—
Whatever's the matter,
Why make such a clatter?
We're not so easy alarmed.
We laugh at decaying,
And think of the saying,
Forewarned is to be forearmed!

P. A.

South Metropolitan Gas Company.—In reference to the report of the proceedings at the half-yearly meeting of the South Metropolitan Gas Company, given in last week's Journal, we have been requested by Mr. Livesey to state that it was not Mr. Baddeley, but Mr. Jackson, who said at the Chartered Gas Company's meeting that the public lighting of the Metropolis amounted to less than one per cent. of the gas sold, instead of 10 per cent.

Frome Water Supply.—At the meeting of the Frome Local Board on Friday, the 4th inst., the Water Supply Committee recommended that the plans of the Egford water supply scheme, prepared by Mr. Henry Tomlison, of Cambridge, be approved by the Board, and that the Clerk be instructed to forward them to the Local Government Board, with the necessary forms and particulars required, in order to obtain their sanction to the loan of £14,000 for the work. This is the maximum sum which may ultimately be required, and includes a large sum for contingencies, which probably will not be needed. It was also resolved to request the immediate attention of the Central Authority, so that the necessary inquiry can be held at the earliest possible date, as the letter of licence from the Earl of Cork expires on the 6th of November next. The report was unanimously adopted. Mr. Tomlison, who was present, read his specification of the proposed works, with the estimate of cost, which is as follows:—Completion of experimental well, £150; engines, boilers, and buildings, £2870; rising main, £552; reservoir, £1883; supply and distributing mains, sluices, and hydrants, £5087; small service-pipes, £500; contingencies, £1104; engineer's commission, £670; land and assessments, £1000; tenants compensation, £50; legal, preliminary, and miscellaneous expenses, £265—total, £14,000.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Oct. 16.

(*Before Justice* Hawkins, *Vacation Judge.*)

WILDE *v.* WELLS AND CO.

The plaintiff in this action is the inventor of certain improvements in machines applicable for the purposes of the electric light, for which he obtained a patent in 1863. Hitherto the machines have not come into general use, and the patent was last year extended by the Privy Council for a further period of seven years. Last June, the plaintiff saw the electric light in operation in Paris, and discovered that it was produced by electricity generated by machines supplied by the Société Générale d'Electricité. As these machines were constructed on the same principle as the plaintiff's patented invention, he placed himself in communication with the Société, and discovered that it was intended to introduce their machines into England. He thereupon informed the Société that, having regard to his patent, no such machines could be introduced into England without his consent. Negotiations were opened between him and the Manager of the French Company, who appeared quite satisfied that the patent was fully protected in this country, and that it would be necessary, before introducing that method of electric lighting here, to pay plaintiff a reasonable sum for his licence. Whilst these negotiations were in progress, the defendants, Messrs. Wells and Co., of Shoreditch, issued a circular, by the fourth paragraph of which plaintiff was enabled to ascertain that they were about to introduce the French method of the Société Générale d'Electricité.

Mr. Aston, Q.C. (with him Mr. Sumner) read two affidavits setting forth the above statements, and claiming for plaintiff the sole patent rights, and moved, *ex parte*, for an interim order over Wednesday next, restraining the defendants from selling such machines so as to infringe the plaintiff's patent, and also asked for leave to serve notice of motion with the writ.

Justice Hawkins granted both applications.

DEVONPORT POLICE COURT.—Wednesday, Oct. 9.

(*Before the* Mayor *and a Bench of* Magistrates.)

THE SUPPLY OF WATER FOR DOMESTIC PURPOSES.

Mr. *G. H. E. Rundle*, Solicitor, of Stoke, Devonport, appeared in answer to three summonses, taken out by the Devonport Water-Works Company, to show cause why he should not be fined, or otherwise dealt with according to law, (1) for that he, on the 25th of September and previously, having a supply of water from the Company for domestic purposes, did use such water for his greenhouse, being a purpose other than he was entitled to use such water for; (2) for that he, on or about the 25th of September, fixed, or allowed to be fixed, a communication-pipe, without a special agreement; (3) for that he, on the 25th day of September last, and on various occasions since, did suffer a pipe and other apparatus attached to his greenhouse to be so used and contrived as that the water supplied to him was likely to be misused, contrary to the statute.

Mr. R. G. Edmonds appeared for the Company; Mr. Rundle conducted his own defence.

Mr. Edmonds said that the matter was a very simple one, depending upon the construction to be put upon one or two sections of Acts of Parliament. There was the original Act of the Company and the subsequent Act of 1876, the 19th section of which gave consumers a sufficient supply of water for domestic purposes; and the question arising in this case would be, what was "a sufficient supply" for domestic purposes. The Company held that water used in a greenhouse was not used for domestic purposes. He should show clearly that the premises on which Mr. Rundle used the water supplied to him for domestic purposes were no part of the dwelling-house. It seemed to have been a disputed point of law what were "domestic purposes," and for the benefit of water companies the Water-Works Clauses Act of 1863 was passed, and was incorporated with the Devonport Water Act. The 12th section of that Act provided that the supply of water for domestic purposes should not include water for cattle, or horses, or for gardens, or for any trade or manufacture, or for fountains or any ornamental purpose. He (Mr. Edmonds) would show that Mr. Rundle had two greenhouses on his premises, one 50 feet by 10 feet, and the other 29 feet by 16 feet, and that he took water from a pipe supplying his house for domestic purposes, and used it in these greenhouses. The Company alleged that this was not using the supply for domestic purposes. He (Mr. Edmonds) contended that a greenhouse was merely a garden covered with glass. It did not matter whether one grew plants in pots or in beds, and he put it to the Bench that inasmuch as no water could be used, out of the pipe for domestic purposes, for watering gardens, it could not be used in a greenhouse. Anybody who had a garden had to make an agreement with the Company and have water for that purpose by a meter, and the greenhouse in question being really a garden under glass, the watering of the plants was not using water for a domestic purpose. That was one of the points he had to put before them. There was also a provision, in the 12th section of the Act he had quoted, that such water could not be used for any ornamental purpose, and he might further argue that using water in a greenhouse was using it for an ornamental purpose. At present, at all events, he would content himself with the first point.

Mr. *H. Francis*, the Manager of the Company, examined by Mr. Edmonds, said he knew the premises of Mr. Rundle, at Stoke. The dwelling-house was supplied with a pipe for domestic purposes, and there was also an agreement for a supply to Mr. Rundle's fountain and garden by meter. For other than domestic purposes water was supplied by meter. Mr. Rundle had also two greenhouses, in which there were plants in pots, and vines in the ground. On the 25th of September, witness ascertained that the water to one of these greenhouses was brought from the domestic supply of the house, and did not come through the meter. Consequently all the water used in that way would not be paid for. He one morning met Mr. Rundle, who then consented to take a supply of water for the greenhouse by meter; but afterwards said he considered he was entitled to water for his greenhouse through the pipe for domestic purposes.

Cross-examined by Mr. Rundle: He could swear that a tap in the greenhouse in question was connected with the domestic supply on the 12th of September. He could not say how long before. It was not disconnected by his order.

Mr. Rundle: Did you not say to a plumber, "That pipe must be disconnected"?

Witness: I said so to you on the 4th of September.

Did I not say that if it was allowed to remain until the spring of the year I would alter it?—Yes; and my answer was, "You must have it connected with the meter."

Have you charge of all the greenhouses in the neighbourhood?—Yes; and I have assessed a good many. Where we can find them out we assess them.

John Bellamy, Mr. Rundle's gardener, deposed that the greenhouses in question contained vines, and plants in pots. They were watered with a watering-pot from a pond. At the present time they could draw water

from the tap. It had always been so, but he never used any water from the tap. He watered nothing but the larger plants in the greenhouse.

Mr. RUNDLE, at this point, argued that the offence with which he was charged being a penal one, the prosecutors were bound to specify the date on which the offence was committed.

Mr. EDMONDS contended that, the evidence having been heard, it was too late now to raise this objection; but

The MAYOR held that the Company were bound to specify a date on which the offence was committed.

Mr. EDMONDS suggested that he should call Mr. Rundle, as he used the water, and no one else was able to say it was used on the day named.

The MAYOR ruled that Mr. Rundle could not be called.

Mr. EDMONDS: Then the principle of whether it is right to use a domestic supply for greenhouse purposes is not involved. The question is whether the water has been used or not.

The MAYOR said the Bench were of opinion the summons must fall through.

The second summons was then gone into.

Mr. RUNDLE said that he took objection to this summons, because, upon the face of it, it alleged no offence. The 19th section of the Water-Works Clauses Act—under which the summons was granted—provided that it should not be lawful for any owner or occupier of any premises supplied with water by the undertakers to fix, or cause to be fixed, any pipe, &c. The summons simply alleged that he had fixed a pipe on his premises, and that he contended he had a perfect right to do. If the summons had said that he fixed a pipe to the Company's supply, and had thereby obtained water, it would have been a different thing; but it did not allege that. The Company had omitted those words, and he was therefore entitled to say the summons would not lie against him.

Mr. EDMONDS: The first summons was with reference to having used the water; now you are charged with fixing a pipe with the view of using the water. The summons is in accordance with the Act, inasmuch as it states that he has fixed a pipe to the pipe belonging to the undertakers.

The MAYOR: But you don't say in the summons that he has done so. You don't say that the pipe you allege to have been put in is in connection with the service of the Company at all. It might be in connection with a pond or a rain-water cistern for aught this summons shows.

Mr. EDMONDS said it followed the words of the section. Did not the section mean that they must show that the premises were connected with the undertakers pipes?

The MAYOR repeated that there was nothing in the summons which showed where the pipe was connected.

Mr. RUNDLE: You say it is fixed with a communication, that is all.

The MAYOR, after consultation, said the Magistrates were all agreed that the connection of the pipe in question with that of the Water Company must be shown upon the summons.

Mr. RUNDLE: Then I shall ask you to say this summons is also dismissed.

The MAYOR: Yes; but it is dismissed on a technical point, you know.

Mr. EDMONDS asked leave to apply for a case, and his application was granted.

Mr. RUNDLE, in reference to the third summons, said that it was taken out under the 17th section of the Water-Works Clauses Act, and to it he should plead not guilty, and he thought the bench would allow him to draw their attention to the wording of that summons also. He objected to the summons because section 17 said, "If any person supplied with water by the undertakers wilfully or negligently causes"—those were the words. But he was not charged with wilfully or negligently doing anything at all, and he, therefore, contended the Bench had no jurisdiction in the matter.

The MAYOR: What do you say to that, Mr. Edmonds?

Mr. EDMONDS: I say "wilfully" is implied.

The MAYOR: But you must show it on your summons.

Mr. EDMONDS: It is very easy to put it in.

The MAYOR: The summons clearly does not show the offence described in the Act.

Mr. EDMONDS said under the 8th regulation of the Devonport Water Company, which was law, it was shown that no hose was allowed without special agreement, and there was no agreement with reference to this particular greenhouse.

Mr. RUNDLE: I am not charged with that.

Mr. EDMONDS: Then I say you have a contrivance whereby water is likely to be misused.

The MAYOR: That explanation is just as bad as the former one.

Mr. EDMONDS: Then I must ask that the word "wilfully" be put in the summons.

The MAYOR, after consultation, said: We see no reason to amend it; we think the summons is insufficient.

Mr. EDMONDS, after conferring with Mr. A. Bone, the Secretary of the Company, said they would not offer any evidence on the second and third summonses.

The summonses were accordingly dismissed.

Mr. RUNDLE applied for costs.

The MAYOR said that, as the cases were not decided upon their merits, but were dismissed on technical points, the Bench considered that the parties should bear their own costs.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

COURT OF COMMON COUNCIL.

At the Meeting of the Court last Thursday—the LORD MAYOR in the chair—the report of the Chief Gas Examiner of the Metropolis, an abstract of which appeared in the JOURNAL of the 8th inst., was presented, and referred to the Gas and Water Committee.

Mr. SHAW asked the Chairman of the Committee (Mr. Cox) whether their attention had been called to the winter instructions of the Gas Referees, recently issued, which raised the maximum of ammonia allowable in the gas from 2½ to 4 grains per 100 feet; and, if so, what action had been taken in the matter.

Mr. COX said that the notification of the Referees had been brought under the attention of the Committee, and they were advised that not only was the ammonia deleterious to the public health, but that it was not economical to have it in the gas; that it was wasteful, the product being valuable if properly taken care of. The Committee had sent to the Board of Trade the strongest form of remonstrance that official etiquette would allow. It called their attention to it, and begged that they would so deal with the Gas Referees that, if possible, the ammonia should be reduced to its former amount.

Mr. SHAW said that he had intended to put this question, because the present Referees, when they came into office, raised the maximum of sulphur to a very considerable extent, and it appeared that under such circumstances the testing of the purity of gas was becoming altogether a farce. He thought something should be done by the Committee in the way of expressing their astonishment and dissatisfaction at the manner in which these matters were conducted by the present Referees.

Mr. INNES asked whether the Commissioners of Sewers, or any Committee of the Court, had investigated the subject of the electric light.

Mr. BASSINGHAM replied that he had received no notice of this question, but he might say that the matter was before the Streets Committee of the Commissioners of Sewers, and he presumed that at the next meeting of the Commissioners some definite place would be selected in which to try the electric light.

Mr. RUDKIN remarked that the Markets Committee had made an arrangement to try the electric light in Billingsgate. These arrangements would be perfected and carried out about the middle of next week.

METROPOLITAN BOARD OF WORKS.

At the Meeting of the Board last Friday—Mr. E. D. ROGERS in the chair—the Works and General Purposes Committee presented the following report:—

Your Committee have proceeded upon the resolution of the Board of the 28th of June last, referring it to them to consider and report as to the advisability of making an experiment with the electric light on the Victoria Embankment. In connection with this reference your Committee have considered the letter referred by the Board on the 5th of July last from Jules Gaudet, intimating his willingness to place before the Board all the information and details with regard to the mode of lighting the streets of London by electricity as adopted by the Municipality of Paris. Your Committee have also had before them communications from Mr. A. Apps, Mr. R. Applegarth, Manager of the Electric Lighting works, and Dr. R. Vassard, offering to supply information on the subject of the electric light. Your Committee have conferred with your Engineer and Consulting Chemist, and have received from those officers a report in which they state that, having regard to the conflicting opinions which exist amongst those qualified to judge as to the present and future value and significance of the electric light, they consider it impossible to form a correct judgment as to its application, effects, and cost, without some considerable practical experience of its working. They, therefore, suggest that it would be desirable to make a large and continued experiment, and they propose that arrangements should be made to test the nature of the electric light along the whole length of the Victoria Embankment, a distance of about a mile and a quarter. They further suggest that, if it were thought desirable, the experiment might be extended to Waterloo Bridge, and they submit with their report a letter received from M. Jules Gaudet, the agent in London of the Société Générale d'Electricité, offering to contribute to the experiment in the following manner:—

1. That a 20-light electric battery be placed at the service of the Metropolitan Board of Works on loan for a period of three months, to date from the day of lighting up.

2. That 20 Jablochkoff lamps, commutators, globes, &c., &c., be supplied in like manner for a like period.

3. That an engineer and foreman of the Société Générale be appointed to superintend the erection and general organization of the lighting apparatus.

4. That the Société Générale supply the necessary quantity of "candles."

5. That the Board of Works supply the motive power equal to 25-horse power, with driving-wheel, necessary bands, &c., all in first-rate working order.

6. That the Board of Works pay for all conductors (wires) and all standards for the lamps, materials, and labour for erection of same, also the travelling expenses, fees, and wages of the French engineer and foreman referred to, for a period of 15 days, a competent engineer and foreman of their own being engaged on the job from the first.

Your Committee, having carefully considered the question, concur in the view that it is desirable to obtain practical experience of the working of the system, and they accordingly submit the following recommendation for adoption by the Board:—"That arrangements be made to test the value of the electric light along the whole length of the Victoria Embankment, and subsequently, if considered desirable, upon Waterloo Bridge, and with that view that an offer which has been made by the Société Générale d'Electricité to assist the Board in carrying out the experiment by means of the Jablochkoff light be accepted.

Mr. RICHARDSON, in moving the adoption of the report, said that at the present time no subject was exciting a greater amount of public attention, not only in the Metropolis but throughout the country, than the electric light. So much capital was invested in the manufacture of gas by gas companies that the question whether they were to maintain their present position was one of great interest and importance. The Metropolitan Board of Works, as the central governing body of the Metropolis, were bound to take action in the matter, and try an experiment with the electric light on the Victoria Embankment. It was unreasonable, however, to suppose that any local authority would be prepared to incur the expense of such a trial; but the Board having the Victoria Embankment under their charge, and having an offer from the Société Générale d'Electricité of the loan of the necessary apparatus for three months, free of charge, the Committee believed that it would be right that the Board should take advantage of that offer, and incur the additional expense which would be necessary for the wages of the officers employed, for the "candles" that would be burnt, and for keeping up the machinery. That would certainly involve expense to some little extent, but the Committee thought it well worthy of the Board to incur it, seeing that the object was to ascertain the real value of the electric light. At the same time, the Committee were quite aware that the electric light was in its infancy, and no doubt great improvements in it would be made from time to time. He saw that there was an amendment on the paper, asking the Board to wait until the value of other systems should have been ascertained; but if they were to do that they might wait to the end of time, as doubtless improvements would always be going on, and in the end they would do nothing at all. He trusted that they, as a public board, in dealing with questions of this kind, would embrace the earliest opportunity that offered, and the very fact of their undertaking to test the matter temporarily would enable other persons to bring out their several improvements from time to time, and so perfect a work which was undoubtedly not so at present.

Mr. MONRO seconded the motion.

Mr. LESLIE moved as an amendment—"That any expenditure in relation to the trial of one scheme of electric lighting (Jablochkoff's) is premature in the absence of Lontin's, and the probable great discovery of Mr. Edison, of New York." He gave as an additional reason for not proceeding with the recommendation of the Committee that an injunction had been obtained in the High Court of Justice against the use of it. There was a Mr. Wilde, who had obtained two patents, one in 1869 and one two or three years earlier, and it would be premature for the Board to proceed with these experiments until the result of that injunction was ascertained. He was not aware how much money their Engineer had recommended the Works Committee to apply in carrying out the proposed experiment, but it was quite clear that the expense would be a heavy one, as they would have to bring over a French engineer, and incur a very large number of other expenses. It ought to be remembered, also, that an in-

junction had recently been obtained by Mr. Wilde against the application of the proposed scheme, and it would be absurd for the Board to enter into the matter at the present time. It was said that the price of electric lighting was infinitely below the price of gas; but they ought to know that precisely before they went on spending money and committed themselves to these experiments. A great deal had occurred since the Board last met, and, although he was not opposed to lighting by electricity, he thought they ought to wait until all the experiments were fully developed before they proceeded further.

Dr. BREWER seconded the amendment. He said the present state of the question was crude and complicated, and this plan was a great improvement upon what they had seen some years ago, and they would be by no means loitering behind science if they waited to see which system was the most successful. It was a new application to a very old science, and they would lose nothing by waiting to see which was the best. Possibly another month might bring about a great improvement upon the system which was now proposed.

Mr. RICHARDSON, in reply, said the Board did not propose to adopt the light, but to try it for three months, and then, if they were not satisfied with the trial, they would reject it.

The amendment was then put, and negatived by 15 votes to 4.

Mr. LEGG said the Board ought to pause before they adopted this resolution, on account of the expense that would be incurred. If the Board adopted it, they would have to pay all the cost of a 24-horse power engine, conductors, wires, materials, and engineers fees and wages for 13 days. It was to be carried out under the management of the Frenchmen. They were to have all the management, and their own engineers were to do nothing at all. Before entering, however, upon it, they ought to get, from their own engineers, some estimate of the probable expense. He moved, as a further amendment, that the Board do adjourn the consideration of the question for a week, and, in the meantime, their engineers should ascertain the probable expense of the experiments.

Mr. ELT seconded the amendment.

Mr. LESLIE said he should support the amendment as he had been unable to carry his own, and by Friday next the Supreme Court of Justice would decide whether the injunction was well founded, or whether it had been obtained upon insufficient grounds.

Mr. FOWLER said he believed that waiting for the result of the injunction had nothing to do with them. Was this such a light as ought to be adopted to serve the interests of the public? That was a question which the Board were bound to take up and investigate.

The second amendment was negatived by 16 votes to 5, and the recommendation of the Works and General Purposes Committee agreed to.

NEW ELECTRIC LIGHT COMPANIES REGISTERED.

The *Investor's Guardian* reports the registration of three new Companies in connection with the electric light. They are—

The British Electric Light Company.

The object of this Company is to bring into public notice the advantage of electric force and power as an agent in producing light for general illuminating purposes, and to extend its adoption and use for such purposes. It was registered on the 4th inst., with a capital of £100,000, in £10 shares, the following being the first subscribers:—

	Shares.
John Thomas Emmerson, J.P., Peover, Knutsford	1
Edward James Reed, M.P., Broadway Chambers, Westminster	1
Latimer Clark, 6, Westminster Chambers, Civil Engineer	1
Joseph Hubback, J.P., 6, Sandon Terrace, Liverpool	1
Thomas Horn, Millbank, Engineer	1
Michael Radcliffe Ward, 15, Gloucester Place, Brighton, Mechanical Engineer	1
Sir Charles Tilston Bright, 11, Delahay Street, Civil Engineer	1
Adam J. Blandy, 7, Westminster Chambers, Civil Engineer	1

The number of Directors is not to be less than three nor more than six. Qualification, 50 shares. The subscribers are to nominate the first directors. Remuneration, £750, and, in addition thereto, 10 per cent. of net profits remaining after payment of 10 per cent. dividend.

The Electric Lighting Company.

On the 5th inst., this Company was registered, with a capital of £100,000, in £10 shares, for the purpose of effecting the following objects:—"To light thoroughfares, public places and buildings, manufactories, mines, seas, rivers, houses, ships, &c., by means of electricity, magnetism, or other similar agencies; and also to apply such agencies to the production or transmission of power to the production of acoustic, thermal, chemical, or other effects; also to signalling and other purposes." Power is taken to acquire and work any letters patent relating to the above objects. The subscribers are:—

	Shares.
Emile Erlanger, 43, Lothbury, Banker	225
Robert Jacomb Hood, 58, Lee Terrace, Civil Engineer	10
Sir Philip Rose, Bart., Penn, Bucks	10
John Hollingshead, 14, Pall Mall, Theatrical Manager	10
Lionel Lawson, 2, Brook Street, Hanover Square	225
Charles Ferdinand de Kierkowski Steuart, 7, Collingham Road, Cromwell Road, Civil Engineer	10
Robert A. M'Lean, 8, Old Jewry, Accountant	10

The number of Directors is not to be less than three nor more than seven. Qualification, ten shares. The subscribers are to appoint the first. The Board will be remunerated at the rate of £100 per annum for each Director, and a further sum, equal to 5 per cent. of any surplus net profits remaining after payment of 6 per cent. to the Shareholders.

The Sun Electric Light Company.

Upon terms of an agreement of the 7th inst., this Company proposes to acquire and work the patent invention of Mr. Charles Weightman Harrison, relating to improvements in obtaining light by electricity. The Company was registered on the 9th inst., with a capital of £5000, in £5 shares, with power to increase. The consideration for the purchase of the said patent is £2500, in fully paid shares, and a like moiety of any increased capital. The subscribers are:—

	Shares.
Walter Strickland, 19, Birchin Lane, Discount Broker	1
John Morgan Pimvill, 31, North Villas, Camden Square, Accountant	1
J. H. Downs, 6, High Street, Putney, Corn Merchant	1
Charles Weightman Harrison, 13, Earl's Court Gardens, Engineer	1
Thomas Percy Bedford, 11, Queen Victoria Street, Merchant	1
Walter Herbert Boothby, 57, Wood Street, Woolwich, Clerk	1
James P. Lythgoe, 15, Tressillian Road, New Cross, Accountant	1

The number of Directors is not to be less than three nor more than five. The subscribers are to appoint the first. Subsequent Directors are to be holders of at least 20 shares. Up to the time of the ordinary meeting in 1881 the remuneration of the Directors will be at the rate of £100 per annum each.

METROPOLIS WATER SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the meeting of the Board last Friday—Mr. E. D. ROGERS in the chair—a report was presented from the Works and General Purposes Committee, in reference to their proceedings upon the resolution of the Board of the 4th inst., referring it to the Committee to consider and report upon the advisability of preparing a Bill to be laid before Parliament, providing for the acquisition by the Board of the interests of the several Companies now supplying the Metropolis with water, also upon what steps it will be desirable to take to ensure an improved supply of water. The report stated that the Committee had fully considered the subject, several resolutions had been proposed, but were all negatived, the Committee being divided in opinion as to the mode and time of procedure.

Mr. RICHARDSON (in the absence of Mr. Selway, who had given the usual notice) moved—"That it be referred to the Parliamentary Committee to prepare and lay before the Board a Bill for the compulsory purchase of the interests of the Metropolitan Water Companies, with power to issue the necessary parliamentary notices, and that the whole subject be referred to the Works and General Purposes Committee, with power to confer with Her Majesty's Government, with a view to obtain their approval of the same." He said he regretted exceedingly that such a report should have been submitted by the Committee. After having given every consideration to the subject for a period extending over many years, it was, in his opinion, a lamentable spectacle that the Board did not know their own mind and were unable to express any decided opinion as to whether or not anything should be done under the circumstances. That result was mainly owing to the action of Mr. Runtz, who had for years been pointing out that the public were losing millions of money by leaving this question in abeyance, and yet he now placed on the paper an amendment for delay. All the Board were asked in the resolution to do was to instruct the Parliamentary Committee to prepare a Bill for the purchase of the Water Companies, to issue the necessary parliamentary notices, and to refer the whole subject to the Works and General Purposes Committee, with power to confer with Her Majesty's Government. It would be seen that it pledged the Board to nothing beyond the cost of advertising the notices, and left them all the freedom that could possibly be desired; but the amendment, notice of which appeared on the paper, absolutely destroyed the freedom of the whole Board, and bound them not to spend a single shilling unless they first obtained a promise of support from the Government. He hoped, however, that the Board would decide upon a bold and manly course of action, and that they would not so lower themselves in the eyes of the public as to proceed in the childish manner suggested by the amendment. The simple question was: Was it desirable, in the interests of the public, that the Board should go forward in relation to the purchase of the undertakings of the Water Companies? If it was, he submitted that the duty of the Board in the matter was perfectly clear, and he appealed to every member to maintain the consistency of the Board with reference to such an important subject.

Mr. FELL seconded the motion.

Mr. RUNTZ, as an amendment, proposed—"That no action be taken by the Board towards obtaining power to acquire the undertakings of the Metropolitan Water Companies until the views of Her Majesty's Government on the subject have been ascertained; and that the Works and General Purposes Committee be authorized to communicate with the Government for the purpose of ascertaining their views accordingly." He said that since he had been a member of the Board he had endeavoured to act independently, conscientiously advocating that which he believed to be right. With regard to the amendment of which he had given notice, he intended to persevere with it, and, if he could, carry it. He had taken a very great interest in this question since 1859; but last session the Board had such evidence of the strength of the opposition to their proposal, that it would be useless for them to promote another Bill unless they first obtained the assistance of Government. If he thought that, by promoting another Bill, no expense would be incurred beyond the cost of issuing the notices, he would say, "Go on;" but he was satisfied that if the Board did go on, the expense would be almost as heavy as the cost of the two Bills of last session. As was well known, they were nearly all agreed as to the object in view; but having regard to the expenditure that had already been incurred, even if it involved the loss of a year, it was the duty of the Board first to ascertain if any measure of the kind would meet with the support of the Government.

Mr. LEGG seconded the amendment.

Dr. BREWER said he thought the motion inexpedient, and advised the Board to reject it. He maintained that practically the Committee had reported in favour of the previous question, which, it would be remembered, was moved as an amendment when Mr. Selway succeeded in obtaining the reference. The Works and General Purposes Committee were a Committee of the whole Board. They had discussed and considered the whole subject, and the conclusion at which they had arrived was that, at present, it was not expedient that anything further should be done. Under these circumstances, he would ask whether the Board would accept and carry out that which in committee had been positively and deliberately rejected. He earnestly hoped the Board would be consistent, and that they would see that to carry next session the Purchase Bill, after the manner in which it was met last year, was simply, but decidedly, an impossible task.

Mr. ROCHE said he thought the arguments of the last speaker were most extraordinary. It appeared that the Committee were a small one, and everybody voted against everybody else's resolution, the result being that they did nothing. The Committee having done nothing, Dr. Brewer asked the Board to adopt what the Committee had done. That was the policy of Dr. Brewer, and because Mr. Richardson had endeavoured to extricate the Board from this "do nothing" policy, his proposal was called unconstitutional. In his (Mr. Roche's) opinion, it was a direct and proper method by which the Board might give a decision, aye or nay, as to which course should be adopted. With the exception of those gentlemen who did not think the Board ought to acquire the water supply at all, they were all agreed that it would be injudicious to take this Bill to a second reading unless they had the support of the Government. All that the motion said was that the notices should be given, and a Bill prepared, but it was said that this would involve the Board in an enormous expense. It would do nothing of the sort, and in order to make this perfectly clear, he would be prepared at the proper time to propose the addition of certain words to the resolution, limiting the expenditure to the cost of the notices. The Bill was already in existence, and would only have to be reprinted. Supposing the amendment was carried, and they went to the Government, and if Mr. Cross should tell them that the Government would be prepared to support such a Bill, but that the necessary notices not having been given, the Government could not give them that support which they would otherwise afford, what would be the position of the Board? If words were added such as he had suggested, he could not see what possible objection there could be to the motion.

Mr. LESLIE said he must strongly oppose the motion. Mr. Richardson's idea seemed to be that the Board should bully Parliament until they were made the distributors of water, no matter how much it might cost, and great care seemed to be taken that the public should not know how much

the cost was. He believed the ratepayers would be ten times worse off than at present if the Board had the mismanagement of the water supply. He felt the Bill was a sham, and thought the Board had as much chance of acquiring the Bank of England as the Water Companies.

Mr. FOWLER said that while maintaining that the water supply of the Metropolis should be in the hands of the responsible public authorities, he thought the Board had not yet taken sufficient pains to show how the public would be benefited by the contemplated change.

Mr. FREEMAN said that two courses had been suggested to the Board. One was that they should give the proper notices and prepare a Bill, and, without doing anything further, ask the Government if they would assist in procuring a second reading for the measure, in order that it might go before a Committee of the House. The other course was that they should not give the notices, or, in fact, do anything, but first go to the Government, and ask for their assistance. Under the circumstances, he should vote for what appeared to him to be the most business-like course, and that was, that a Bill should be prepared, and that the necessary notices should be issued which, instead of costing £2000 as had been stated, would not cost above £200. He, therefore, hoped the Board would agree to the motion, as against the idea of suspending all action in the matter for a year by asking the Government to give their support and assistance to a Bill which was not in existence.

The Board divided, and the amendment was lost by 14 votes to 9.

The original motion was then amended, so as to read as follows:—"That it be referred to the Parliamentary Committee to prepare and lay before the Board a Bill for the compulsory purchase of the interests of the Metropolitan Water Companies, with power only to issue the necessary parliamentary notices, and that the whole subject be referred to the Works and General Purposes Committee, with power to confer with Her Majesty's Government, with a view to obtain their approval of the same, previous to any further expense being incurred."

This as a substantive motion was carried by 14 votes to 6.

Major Bolton reports that the state of the water in the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated), was in a fairly good condition during the whole of the month of September. The highest flood state of the river, at Molesey and Hampton, during the month was 1 foot 2 inches above summer level, and the lowest, 3 inches below the summer level. The rainfall, as taken at the Chelsea works, was 0·80 inches in September. The water in the River Lea was in good condition, and generally clear during the month.

Dr. Frankland reports, as the result of his analyses of the waters supplied to the Metropolis during September, that taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending Dec., 1876, to represent unity, the proportional amount of such impurity in an equal volume of water supplied by each of the other Companies, and by the Tottenham Local Board, was:—Tottenham 1·2, Colne Valley 1·2, Kent 1·5, New River 2·0, East London 2·9, Chelsea 3·4, Grand Junction 4·1, Southwark 4·3, West Middlesex 5·2, and Lambeth 5·3. The water abstracted from the Thames by five out of the eight companies supplying the inner circle was again of inferior quality; and that delivered by the Lambeth Company was also turbid, and contained moving organisms. The Chelsea Company's water was of better quality than that distributed by the other Thames Companies. The water of the Lea, delivered by the New River and East London Companies was of much better quality, and had been efficiently filtered. The water supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board, was clear and of its usual excellent quality for dietetic purposes. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; New River, clear and very pale yellow; East London, West Middlesex, and Chelsea, clear and pale yellow; Southwark and Grand Junction, clear and yellow; Lambeth, turbid and yellow.

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matters.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	24·70	·176	·018	·001	·129	·148	1·6	18·3
West Middlesex	26·32	·261	·046	0	·132	·178	1·6	18·0
Southwark	27·30	·224	·033	0	·142	·175	1·6	18·6
Grand Junction	27·50	·220	·026	·002	·125	·153	1·6	18·0
Lambeth	28·00	·304	·024	·001	·164	·188	1·65	18·6
Other Sources—								
New River	28·30	·102	·017	0	·167	·184	1·6	19·0
East London	27·06	·146	·029	0	·148	·177	1·8	17·7
Kent	45·68	·076	·017	0	·501	·518	2·6	28·4
Outer Circle.								
Colne Valley	21·28	·055	·016	0	·277	·293	1·4	6·0
Tottenham Local Board	47·80	·062	·012	0	·463	·475	3·4	29·3
Corporation of Birmingham*	26·00	·141	·051	·002	·099	·151	1·7	16·5
Corporation of Glasgow+	3·20	·144	·026	0	·007	·033	0·6	·95

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
+ Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

ABANDONMENT OF THE PROPOSED PURCHASE OF THE LIVERPOOL GAS-WORKS.

The Special Gas Committee of the Liverpool Town Council held a meeting last Tuesday—Dr. CROSS in the chair—and, after some discussion, it was agreed to admit reporters.

The CHAIRMAN moved—"That, having regard to the recent discoveries with respect to the electric light, the Committee consider it advisable to postpone for the present the consideration of the advisability of purchasing the undertaking of the Liverpool United Gaslight Company."

Mr. PEET seconded the motion.

Mr. BROCKLEBANK moved, as an amendment—"That the following report of the Special Committee as to Gas Supply, dated the 15th inst., be adopted and printed, and a copy sent to each Member of the Council."

In the report, dated June 25, 1877, presented to, and adopted by, the Council, Aug. 1, 1877, the Committee were instructed in the closing paragraph (which was inserted as an amendment) in the following terms:—"In order, therefore, that this question may be determined by the Council, the Committee beg to recommend that this Committee should be empowered to confer with the Gas Company as to the possible purchase of the gas-works at a price satisfactory to the Committee, subject to the approval of the Council, and the sanction of Parliament."

This instruction has not been brought under the consideration of the Committee, nor, within the knowledge of the Committee, have any steps been taken to carry it into operation.

The Committee have seldom been called together, and no business has been transacted during the past year save and except the election of Chairman, and further testing the quality of gas as supplied by the Gas Company.

The Committee was first formed four years ago, and no progress has been made during the whole period in carrying out the main purpose for which it was appointed—namely, "to consider the advisability of acquiring the undertaking of the Liverpool United Gaslight Company, and to report thereon."

The Committee, being of opinion that there is a reasonable probability that the electric light may be so improved as to supersede the use of coal gas, and that the only points hitherto submitted to them for consideration are such as would fairly and properly come within the province and scope of the Watch Committee, cannot recommend its reappointment.

Mr. M'ARDLE seconded the amendment, which, after some discussion, was carried by 7 votes to 2.

Votes of thanks were then passed to the Chairman, and to Mr. Peet, the Deputy-Chairman, for their services during the past year, and the Committee separated.

CHEPSTOW GAS COMPANY.

The following are the accounts of the Chepstow Gas Company for the year ended June 30, 1878, referred to by Mr. W. Doré in a letter published in our "Correspondence" columns this week:—

Capital Account.

Subscribed capital	£6800 0 0	Expended to June 30, 1877	£7714 10 10
Borrowed on debentures	1250 0 0	Further expenditure	*nil*
		Balance expended	335 9 2
	£8050 0 0		£8050 0 0

Manufacturing Account.

Coal and charges thereon	£525 18 5	Gas sold to private consumers, 5,530,900 cubic feet	£1383 1 8
Purification	26 1 1	Gas sold for public lighting 648,600 cubic feet	145 18 7
Stores	10 1 11	Coke sold, less charges	75 6 0
Stokers wages	135 14 6	Tar sold, less charges	61 12 2
Maintenance of buildings	62 16 8	Ammoniacal liquor sold, less charges	6 9 2
Retorts and retort-house	101 18 11		
Manufacturing plant	69 7 3		
Renewal of service-pipes	34 11 3		
Distribution charges	10 16 8		
Salary	149 3 0		
Stationery and office charges	19 3 3		
Rates and taxes	29 14 9		
Incidental charges	7 12 3		
	£1181 19 11		
Balance to revenue account	490 7 8		
	£1672 7 7		£1672 7 7

Maintenance of Meters Account.

New meters	£10 19 0	Meter-rents	£92 14 5
Repairs, testing, and maintenance	19 15 0	Old meters sold	0 14 4
Sundry charges	3 4 8	Sundry receipts	0 4 1
Balance to revenue account	73 14 5	Stock	14 0 3
	£107 13 1		£107 13 1

Fittings Work Account.

Stock—1877	£59 12 6	Charges to consumers	£165 15 7
Materials and wages	158 17 11	Fittings used in connection with the works	23 11 2
Balance to revenue account	37 11 0	Sundry receipts	2 14 1
		Stock	64 0 7
	£256 1 5		£256 1 5

Maintenance of the Public Lamps.

Materials for maintenance and renewals	£11 3 4	Charges for service rendered	£48 7 0
Wages paid and sundry charges	27 15 7	Sundry receipts	1 1 0
Stock	17 7 0	Stock	14 13 0
Balance to revenue account	7 15 1		
	£64 1 0		£64 1 0

Public Lighting Account.

Wages paid	£18 18 6	Charges for services rendered	£20 16 0
Stores used, &c.	1 1 6		
Maintenance of tools, &c.	0 12 0		
Balance to revenue account	0 14 0		
	£20 16 0		£20 16 0

Cottage Account.

Repairs	£1 15 6	Rent received	£5 4 0
Balance to revenue account	3 8 6		
	£5 4 0		£5 4 0

Interest Account.

Interest upon debentures	£69 15 0	Interest received	£15 16 0
Bankers charges	17 0 0	Revenue account	70 19 0
	£86 15 0		£86 15 0

Revenue Account.

Interest account	£70 19 0	Manufacturing account	£490 7 8
Bad debts	11 10 3	Meters account	73 14 5
Profit and loss—net amount earned during the year	532 4 8	Fittings account	37 11 0
		Maintaining public lamps	7 15 1
		Public lighting	0 14 0
		Cottage account	3 8 6
		Transfer fees	1 3 3
	£614 13 11		£614 13 11

Profit and Loss Account.

Balance—1877	£666 8 1	Dividend declared for the year ended June 30, 1877	408 0 0
Revenue account	532 4 8	Balance	790 12 9
	£1198 12 9		£1198 12 9

Dividend Account.

Unpaid dividends—1877	£60 0 0	Dividends paid	£396 0 0
Profit and loss	408 0 0	Dividends unpaid	72 0 0
	£468 0 0		£468 0 0

General Balance.

Capital account, balance thereof	£335 9 2	Amounts due to the Company in arrear	£295 15 4
Profit and loss account, balance thereof	790 12 9	Current accounts	313 17 11
Unpaid dividends	72 0 0	Cash at bank	134 19 2
Sundry tradesmen	119 6 9	Cash on deposit	400 0 0
		Stock	172 16 3
	£1317 8 8		£1317 8 8

DINNER TO MR. J. BLACKBURN, OF CALCUTTA.

A Complimentary Dinner was given on Thursday last, the 17th inst., at the Mitre Hotel, Manchester, to Mr. James Blackburn, of Calcutta, who is just now on a visit to England. Twenty-two Gas Managers and Engineers and other friends were present, and many letters of apology for absence were received. Mr. THOMAS NEWBIGGING occupied the chair, and Mr. DAVID CLARKE, of Ashton-under-Lyne, President of the Manchester District Institution of Gas Engineers, the vice-chair.

After dinner, and the usual loyal toasts having been duly honoured, the health of Mr. Blackburn was proposed by the Chairman, and heartily responded to by the company assembled.

The CHAIRMAN said that it was a great pleasure to him to have the duty of proposing the health of Mr. Blackburn, their esteemed guest of the evening; and he could assure him that, notwithstanding his long absence from amongst them, they often thought of him kindly, and remembered the time when he was one of the most active home members of the profession to which most of them belonged. The inauguration of the British Association of Gas Managers afforded scope for Mr. Blackburn's abilities, and they all knew with what assiduous attention he devoted himself to its interests; how he controlled and managed its affairs until it became a useful and important institution. Before that time gas managers were very isolated individuals; there was but little community of feeling among them, and although they now knew that, as a rule, the possession of the name of gas manager might be said to be synonymous with the possession of a kind heart and a clear head, yet at the time of which he spoke there was, amongst the members of the gas interest, considerable shyness, if not actual distrust, exhibited one towards another. The Association altered all that, and to Mr. Blackburn, who was its guiding spirit during the earlier years of its existence, great credit was due for the manner in which he piloted it through its first difficulties. They remembered all that, and they rejoiced to have the opportunity of testifying to their guest, personally, that they had not forgotten him. They regretted his departure from amongst them, and they would rejoice whenever he determined to return home again; but whether here in England, or there in India, they wished him, and his wife and family, prosperity, happiness, and health. The Chairman also referred to some of the changes that had taken place amongst gas managers during the ten years of Mr. Blackburn's absence, and alluded feelingly to the well-known faces that had been removed by death, and especially to the recent loss which the gas world had sustained in the death of Mr. William B. King, the Editor and Publisher of the JOURNAL.

Mr. BLACKBURN, in answer to the toast, expressed the great pleasure it afforded him to meet so many of his old friends and associates, as well as the younger members of the profession who were present. He felt gratified and honoured by the mention of his name in connection with the British Association of Gas Managers, and should always remember, with feelings of pride and satisfaction, the years of his life when he was actively connected therewith. He was pleased to observe its continued growth, and hoped and believed it would long live to confer benefit on its members generally.

Other toasts followed, being proposed by Messrs. Hunter, Carr, Dempster, Cocks, Veevers, Hutchinson, the Vice-Chairman, and others; Messrs. Smith, Dalgliesh, and Braddock supplied the music, and an agreeable and pleasant evening was spent.

BINGLEY IMPROVEMENT COMMISSIONERS GAS-WORKS.

The following is an analysis of the accounts of the Bingley Improvement Commissioners Gas Department for the year ending June last:—

—	Receipts.	Expenditure.	Cost per 1000 Feet Made.	Cost per 1000 Feet Sold.	Cost per 1000 Feet. Made.	Cost per 1000 Feet Sold.
	£ s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.
INCOME.						
Consumers & public lamps } Feet. 30,744,700						
Leakage. . 1,404,300 { or 4·56 p. c. on gas made.						
29,340,400	5990 17 8	—	—	—	—	—
Residual products (coke). . . .	775 1 6	—	—	—	—	—
Tar and liquor	399 14 11½	—	—	—	—	—
Other receipts	229 8 2¾	—	—	—	—	—
EXPENDITURE.						
Manufacture account—						
Wages, stokers, purifying, & coalers	—	553 12 1½	0 2·76	0 2·89	—	—
Coal and cannel, 3200 tons . . .	—	1692 4 7	1 1·21	1 1·84	—	—
Lime and oxide.	—	85 3 10	0 0·66	0 0·70	—	—
Tools and materials	—	60 0 0	0 0·40	0 0·49	—	—
Maintenance account—						
Wages account	—	445 18 2	0 3·48	0 3·65	—	—
Maintenance, repairs, mains, services, retorts, &c.	—	577 0 6½	0 4·50	0 4·72	—	—
Management—						
Salaries	—	335 0 0	0 2·61	0 2·74	—	—
Rates and taxes	—	133 18 0½	0 1·04	0 1·09	—	—
Interest on loans	—	1546 17 6	—	—	1 0·00	1 0·65
Sinking-fund	—	922 10 0	—	—	0 7·20	0 7·54
Balance	—	1242 17 0½	—	—	0 9·70	0 10·16
	7395 1 10	7395 1 10	2 4·66	2 6·12		
Less residual products £1174 15s. 11½d.			0 9·10	0 9·60		
			1 7·56	1 8·52		

Average yield per ton of coal sold, 9169 feet; illuminating power, 17·63 sperm candles.

RAILWAY TRAVELLING BY GASLIGHT.

The Dublin *Freeman's Journal* of Wednesday, the 16th inst., says: Last evening a party of Railway and Gas Directors and Officials made formal trial of the system of lighting railway carriages with gas, which has been partially in force upon the Dublin and Kingstown line during the past week. The substitution of gas-lamps for dim and smutty oil-lamps has been this long while forcing its way into all the great English railway systems; but in the form in which the experiment was made last night on the Kingstown line, there has been a prodigious advance upon the first clumsy adaptations of gaslight to the illumination of passenger trains.

The patent is the well-known one of Mr. Sugg. Its distinctive merit is that it has overcome the effect of the motion of the train, and instead of producing a jerky and uneven flame, has secured an absolutely steady light, of any degree of intensity desired. Underneath each carriage are fixed two cylinders, 6 feet long, of 9 inches bore, connected by pipes with the lamp in the centre of each compartment. At the commencement of the journey the cylinders are charged with gas sufficient for 15 hours consumption, the calculation being that a single lamp can be fed for that time by 3½ cubic feet of common 16-candle gas.

The new gas-lamp, hung in the centre of the roof of the compartment, has a glass bowl, like that of the old oil-lamp, in the centre of which is fixed an Argand burner, in which the gas is lit from the top. The gas with which the cylinders were stored last night was manufactured specially for the purpose at the Alliance Gas Company's works, and had an illuminating power of 35 candles, the pressure being 80 lbs. to the square inch. The effect of the illumination was to render the railway compartment, while the train was hurried along at express speed, as brilliantly and evenly bright as a drawing-room. The vibrations of the carriage had absolutely no effect upon the flame, which burned as steadily as in a street-lamp, and infinitely more brightly.

Another triumph for the patent is the complete freedom from smoke which it ensures. So free are the new lamps from the soot and grime which begin to creep over the filthy oil-lamps after an hour's travelling that, although those used last evening had been at work for several journeys without cleansing, the glass was still perfectly unsoiled. If lights of anything like the same power as last night's came into common use, reading in railway carriages by night would become a downright luxury.

It is stated that gas of average quality can be supplied on railways, under this patent, upon much cheaper terms than the present hideous contrivance for making darkness visible. The skilled critics who attended last night's experiments appeared to be completely satisfied with the commercial side of them, and unskilled railway travellers will have reason to pour blessings on the head of the patentee, if his luxurious light should ever find acceptance among Irish railway directors.

Among last night's party were Mr. David Sugg, son of the patentee; Mr. E. Footte, Chairman of the Dublin, Wicklow, and Wexford Railway Company; Mr. David Drimmie, and Mr. John R. Wigham, Directors of the Alliance Gas Company; Mr. E. H. Waterfield, C.E., Engineer, and Mr. W. F. Cotton, Manager and Secretary of the Gas Company.

PROPOSED PURCHASE OF THE DERBY WATER-WORKS BY THE CORPORATION.

A Special Meeting of the Derby Town Council was held on Monday, the 14th inst.—the MAYOR in the chair.

Alderman LONSDON moved—"That this Council do promote, during the ensuing session of Parliament, a Bill for acquiring, by purchase, by the Mayor, Aldermen, and Burgesses of the borough of Derby, the undertaking of the Derby Water-Works Company (including all property, rights, powers, and privileges of the said Company), and for other purposes ancillary thereto, and for making further provisions for the improvement of the borough, and for other purposes, and that the district funds and district rates, or rate of the said borough under the control of the Council as an Urban Sanitary Authority, be applied to the payment of the costs, charges, and expenses of promoting such Bill." He said the principle of the proposed purchase of the water-works had been affirmed over and over again by the Council, and the passing of the resolution would be merely taking another necessary step in carrying the matter forward. He thought the Council were pretty much agreed that it was the right thing that the ratepayers of Derby, through their elected representatives, should become the owners and managers and the distributors of that most essential ingredient in the sanitary condition of the town—water. The Council did not think to acquire the property in a way at all injurious to the present proprietors. They anticipated paying a fair marketable value for the purchase, and they merely proposed to carry out a great sanitary improvement, which was in accordance with the spirit of the times. He had just been told that at Cardiff they had arranged to take over the water-works' and at Scarborough they were doing the same thing. There was a peculiarity about Scarborough. Twenty-five years ago, the Corporation possessed the water-works, but could not make them pay. They sold them to a private company, but becoming of opinion that the undertaking should be possessed by the Corporation, they had again taken the works over. The Derby water-works had been owned by the Company for a quarter of a century, but it was thought that the time had arrived that the Corporation would be failing in their duty if they did not take the necessary steps for acquiring the property and managing it for the town. The time had not come for entering into a discussion of the details, but from the nature of the correspondence that had taken place, it was clear that a mutual arrangement could not be made, and therefore the Council must simply say what was absolutely necessary to justify the steps the Corporation were taking one by one. They would have to show the ratepayers that they should be able to make the purchase without it being a permanent burden upon them to any serious extent, and he was sure they would also be able to show that there were many ways in which they could be so far economical that a good article could be obtained, and with better facilities, under such conditions as would induce them to go forward with the scheme.

Alderman LEECH seconded the motion. He said that he was a shareholder in the Water Company, and if the other Shareholders regarded the matter in the same light as he did, they would jump at the proposal of the property being taken over by the Corporation. He hoped that, notwithstanding the manner in which the Chairman of the Company was enabled to convert the Shareholders to the belief that they would never be so happy again as under his *régime*, the Shareholders would take a fair and impartial view of the matter, and would see how much they would pecuniarily benefit by the intended change. He should not like to be compared to the ill bird that defiles its own nest, but from what he gleaned from the reports emanating from the Chairman of the Company, he should be much happier if his money were placed elsewhere. The Company had to pay 7 per cent., and those dividends were partly made up out of the contingent-fund. That fund was mainly constituted by the creation of new stock, which was at a premium, and the premiums were put to the contingent-fund. He was at a loss to discover that the funds arose from any surplus profit. No doubt the statement would get to the Chairman through the Press, and he expected, as a matter of argument, to get the worst of it; but he would like to ask him whether any of the contingent-fund was left, and what they would do for dividends in future years. All that he wanted to make out to the satisfaction of the town was the way these things were done. Take it that 7 per cent. was a correct dividend—and that would require investigation—the Corporation would take over the works, and grant annuities in perpetuity to the holders of the shares equivalent to 7 per cent. or whatever the dividend would be, with power to redeem those annuities in 60 or 80 years; and the time would come when the water-works, with all the plant and everything belonging to them, would be the absolute property of the town. It seemed that they were a long way behind the age in permitting—he said "permitting" in a proper sense—in permitting an individual company to have the control of such an important article as water. Whatever the great American, Mr. Edison, might do, he would be unable to find any substitute for water. He hoped the Council would go into the matter with the determination to do good for the town of Derby. If there was one thing more than another which was objectionable it was the power of interference, which a private company

had, with their streets and thoroughfares. The members of the Corporation must not suppose for a moment that they were going to enter into an arrangement which would yield certain profit. That was not the feeling or principle that should occupy their minds. With great deference to Mr. Hawksley and others, let them endeavour to improve the facilities for obtaining water, and let them have the whole control of it, as they had of other property belonging to them. He hoped all the members of the Council would go together hand in hand, and then depend upon it they would succeed, in spite of all the opposition that might be brought against them. The overtures made to the Company by the Committee were of a most friendly and amicable character. The answer they received was curt; it was short and sweet: "We shall not let you have it." Therefore the Council must ask of Parliament permission to purchase the works, and he should be very much surprised if the Shareholders, after looking thoroughly into the matter, and knowing how well they were protected, and how thoroughly secure they would be in alliance with the Corporation, offered any opposition to the movement.

Mr. STENSON said he had come to the conclusion that the purchase of the water-works, in a sanitary point of view, was very necessary. The cost of the hydrants in the town during the last half year was £191, and £37 for Litchurch. That was a very serious sum of money. If the Council had the works they could use water with great advantage in watering the streets and flushing sewers. He believed that at the last half-yearly meeting of the Company there were great complaints of a guarantee of 10 per cent. profit being given, and only 7½ being paid. They had also been paying out of the reserve-fund, and he thought that fund must now be about exhausted. The purchase of the works by the town would eventually be beneficial to the Shareholders, and he hoped there would be no opposition.

The resolution was then put and carried unanimously, in a Council of 51 members.

HULL WATER-WORKS FINANCES.

At the Meeting of the Property Committee of the Hull Corporation, on Monday, the 14th inst.—Mr. J. LEAK presiding,

The TOWN CLERK presented a report on the statement prepared by Mr. Rayment as to the present water-works debt, and the future mode of dealing with it. The report of Mr. Rayment was as follows:—The Corporation, for the purpose of carrying the Water-Works Acts into execution, have, in accordance with the provisions of the Acts, borrowed money repayable at certain stated periods, generally from one to seven years, but occasionally for longer periods. The security given in each case was the bond of the Corporation, and moneys have, when payable, been renewed upon the same class of security. By this system it is obvious that considerable risk, in the rate of interest to be paid from time to time, has been incurred, as well as considerable trouble and expense in preparing and stamping the renewed bonds. The total sum secured upon these bonds, which represents the "extraordinary" or "construction" account of the water-works, now amounts to £221,214, the interest on which varies from 4 to 4½ per cent., and amounts annually to £9257 4s. 9d. No provision is now made for the extinction or reduction of the present debt; consequently, when the present bonds fall due, they, or the great bulk of them, will have to be renewed. There is not any reserve-fund, or any fund set apart as a depreciation fund. Before, however, proceeding to explain the scheme proposed, it may be advantageous to point out the duties of the Corporation with respect to the debt and the powers as to the payment thereof. The Water-Works Act of 1843, after directing the water-works accounts to be kept distinct from the borough fund, and directing also the extraordinary receipts and payments to be kept separate from the ordinary receipts and payments, and directing an annual payment of £2600 to be paid to the borough fund, stipulates "That if in any year the ordinary receipts from the water-works should prove more than sufficient, then the balance shall be carried to the 'Water-Works Sinking-Fund,' which should, when the Council should deem fit, be applied either in repaying any borrowed money, or in carrying this Act into execution, and that such fund should cease when all moneys borrowed with interest thereon and all expenses had been satisfied. That when this had been accomplished then the water-rents payable should be reduced." The Act further gives the Corporation power to borrow, on bonds or on mortgage, such sums of money as might be necessary for carrying the Act into execution, with power also to re-borrow. The Local Loans Act (an Act affecting the whole country) stipulates as follows:—"Any local authority, notwithstanding any provision in any other Act of Parliament passed before the passing of this Act, may, if it think fit, borrow in manner provided by this Act any loan which it is authorized to borrow. Any local authority may from time to time in like manner re-borrow money for the purpose of discharging any loan lawfully contracted by them either before or after the passing of this Act, provided that the time for repayment of any money so borrowed shall not be extended beyond the unexpired portion of the term for which the original loan was contracted, unless with the sanction of the Local Government Board, and in no case shall be extended beyond the prescribed period." The accounts of the water-works for the year ending 1877 show a considerable balance in favour of the Corporation upon the revenue or ordinary account; consequently the duty devolves upon the Corporation of commencing to discharge its indebtedness, and the Committee think some safe but simple plan should be at once adopted to extinguish the whole debt. The question is, how can this be best accomplished? The Committee propose that the requisite application should as early as practicable be made for leave to borrow, under the Local Loans Act, £221,214, upon the debentures of the Corporation, at 4 per cent. interest, repayable in at least 60 years, and that with the money so raised the present water-works bonds be discharged. As many of the present bonds have several years yet to run (the last becoming payable in 1888), it may not be able to carry out the scheme all at once, but the money could be borrowed from time to time as required. When this arrangement is carried out the Corporation will save over £400 per annum in interest, the expense of renewing bonds, and also be free from the fluctuations of the Money Market. Sixty years have been mentioned, that being the shortest period of time within which it would be advisable to pay off the debt, in justice to the present ratepayers, but it is probable Government may be induced to extend the period to 80 or even 100 years. The question now arises, how is the money to be obtained to pay off the debentures for £221,214 in 60 years. Two modes have been suggested—viz., 1. A sinking-fund. A sum of £940 per annum (over and above the interest of 4 per cent.) invested at compound interest will be ample to provide a fund, at the end of 60 years, sufficient to pay off the debentures for £221,214. The Corporation have previously adopted this principle with respect to the loan for £55,000 already effected. 2. To pay off annually 1-60th of the whole debt. The Committee have very anxiously considered the two methods in all their bearings, and have determined to recommend the first for the acceptance of the Council. It appears to the Committee to have several advantages over the second method, the principal one being that under the second method the present ratepayers would, in the opinion of the Committee, pay a greater proportion of the debt than they ought; whilst under the first the payment would be more equitably spread over the entire period of 60 years. This proposition is proved by contrasting the payment for the first year under the two systems:—Under the first system there would be paid for interest, £8848 5s. 8d.; towards the sinking-fund, £940; total, £9788 5s. 6d. Under the second system there would be paid for interest, £8848 5s. 6d.; one-sixtieth part of £221,214, £3686 18s.; total, £12,535 3s. 6d. The Committee recommend that, in the first instance, the present bondholders should be asked to exchange their bonds for debentures of a similar value; the interest, however, in no case exceeding 4 per cent. The residue of the loan not taken by the bondholders could be raised either (1) by the Corporation itself, or (2) through bankers or brokers to be appointed by the Corporation at a fixed commission. If the first method were adopted, the Corporation might fail to secure the money when required, and would have, no doubt, to expend a considerable sum of money in advertising and negotiation. If the second method is approved, all anxiety on the part of the Corporation would be avoided, because bankers or brokers appointed to raise the money would have to come under legal obligation to the Corporation to produce the money when required. The Committee prefer the latter course, and recommend its acceptance by the Council. It would be quite as economical as the former, and would have the additional advantage of certainty in bringing money into the Corporation coffers when required. The Committee have every reason to believe that their bankers would undertake to raise the money upon the terms named; but, if the Council preferred, brokers of undoubted respectability and satisfactory pecuniary position could be readily found to accept the retainer of the Corporation. The Committee think themselves justified in expressing this opinion, having in view the facts that the debentures could only be issued after a Government inquiry, and with Government sanction, and the lenders would have the security of the rates—a security which the Committee continue to think is unexceptionable. Hitherto the water-works accounts have not, in the opinion of the Committee, been debited with a proper proportion of the Town Hall, or establishment, charges. This, the Committee understand has been conceded by the Water-Works Committee, and it is expected the matter will be shortly arranged by the two Committees. The Committee recommend that in future any balance of ordinary or revenue account after payment of working expenses, interest, and sinking-fund should be carried to an account to be called the "Reserve and Depreciation Fund." That such fund should be available for extraordinary repairs of the present works, and also (as the extinction of the debt would be provided for by the sinking-fund) for any extension of the present works which may be decided upon. If the Corporation adopt the proposal of the Committee they hope it will prove the commencement of a system of Corporation finance creditable to the Town Council, and highly advantageous to the ratepayers, both present and future.

The Town Clerk, in his report, stated that if they borrowed under the Local Loans Act the securities would be by way of debenture payable to a person or his executors, and so on, and under the official seal and official sanction of the Local Government Board. They would not officially sanction an issue of debentures payable to bearer.

The CHAIRMAN said he understood that the Local Government Board objected to allow them to insert in the advertisement that trustees would be justified in taking this stock, because they simply wished it to be made payable to bearer. In other places, such as Leeds, they issued two kinds of stock, one made payable to order, and the other simply made payable to bearer. All the merchants and bankers told them that if it were simply made payable to order they would have some difficulty in placing it.

Alderman WOODHOUSE thought it would be a valuable convertible security if payable to bearer; payable to order made it very difficult indeed.

The TOWN CLERK said that there was no necessity for them to go to Government at all if they did not think fit to do so. They had already issued stock, with official sanction, which put an end to all question. It was the same thing as Consols, with one per cent. more, and the only thing for them to consider was what time they would fix within which to repay the loan. At Bradford, Huddersfield, and, he believed, at Middlesbrough, they had 100 years granted by special Act of Parliament. At Leeds the debentures were issued under the authority of the Leeds Improvement Act, which came into operation the year before last, and in Bradford they were issued under a similar Act. Mr. Rayment said that it would be a great pity to have two forms of securities if they could manage with one. Of the £55,000 debentures they issued lately not one item had been transferred. They had never heard of an application for transfer. They were going to borrow money on Corporation account, and if this issue did not go off well, they could issue the other stock payable to bearer.

After some further discussion, it was resolved that the report be printed and circulated, and that the subject be considered at the next meeting.

THE SEWAGE OF GLASGOW.—The Town Council of Glasgow have had before them a report by Mr. J. F. Bateman, C.E., as to the collection and disposal of the sewage of the city and surrounding district. The area included in Mr. Bateman's scheme contains about 14,900 acres, and the population of the district is estimated at 710,000. Of these 546,000 were, in 1877, within the municipal boundary, on an area of about 5900 acres, showing an average of 92½ persons per acre. In 1861, the boundary contained 360,000 persons on about 5800 acres, or 70 persons per acre, thus showing an increase in the population of about 37½ per cent. in 16 years. At this rate of increase the present population would about double itself in 40 years. The drainage scheme is therefore prepared with the view of providing for a population of nearly a million and a half. It is proposed to carry the sewage to a place some distance below the city, either at Govan on the south, or Dalmuir on the north side of the river, and there, by a process of precipitation, to separate the liquid from the solid, the former being poured into the river in a clarified state, and the latter carried off in barges and thrown into the Firth of Clyde. This great scheme, which is estimated to cost about a million sterling, will be discussed at a special meeting of the Town Council next week.

BARNSLEY WATER SUPPLY.—A meeting of the Barnsley Town Council in committee was held last Tuesday, to consider the advisability of an application being made to Parliament next session for an extension of the present watershed and supply work at Ingbirchworth. Mr. Thomas Hawksley, C.E., who has been consulted in the matter, recommended the Council to go to Parliament for powers to impound water at Scout Dam, midway between Penistone and the present works; also to procure an additional watershed at Carlcoates, near Hazlehead Station. The cost of the new works he estimates at £150,000. The present works, the original estimate for which was from £30,000 to £40,000, have cost £120,000, and are still amply sufficient for the supply of Barnsley and district, the reservoir, which is now full, never having fallen more than 4 or 5 feet below the by-wash during the past summer. The present action is directly owing to the Penistone Local Board of Health having decided to go to Parliament for powers to impound the water at Scout Dam for the supply of Penistone, Thurlstone, Oxspring, and district. After considerable discussion, it was resolved to prepare a scheme, and take the opinion of the ratepayers on the subject.

THE ELECTRIC LIGHT.

The following is the Memorandum submitted by Mr. W. Bassingham to the Streets Committee of the City of London Commissioners of Sewers, with respect to the Electric Light:—

As the object of my visit to Paris was to make some inquiries as to the method of electric lighting which has been adopted there, and to report the result of my practical observation, it is not my intention to enter into any discussion on the comparative merits of various dynamo-electric machines. In America "The Wallace Farmer" and the "C. F." brush machines are exciting some attention. In England, the best known in recent experiments are the "Siemens" machine, and that known as the "Lontin" system, the latter being the method the efficiency of which is advocated by Mr. Hollingshead, who is exhibiting the electric light at the Gaiety Theatre.

Without joining in the controversy as to the claims of this system, either on the score of economy or efficiency, I may mention that, after repeated experiments, it has been abandoned in Paris in favour of the system of M. Gramme; and in order to obtain more complete information of the working of this method of electric lighting, I visited the works of the Company, the Société Générale d'Électricité, which has combined with the machinery of M. Gramme the invention of M. Jablochkoff, whose invention of a carbon candle for the purpose of obtaining a steady and calculable light has been eminently successful.

After a very courteous reception at the Company's works in the Avenue de Villiars, I was directed to the offices of the Administration in the Rue de Drouet, and had an opportunity of witnessing the light under the unfavourable conditions of extremely windy and rainy weather. I am unable to say whether these conditions caused the frequent oscillation of the light, which was a marked feature during my first visit, but I am disposed to think this must have been the case, as, on subsequent occasions, I was both pleased and astonished, not only with the brilliancy, but with the steadiness of the illumination. The shadows of which I had heard so much were far less intense than I had expected, and the light was so perfectly diffused, that, in the Avenue de l'Opéra—a fine and spacious street, well fitted for an experiment in electric lighting—I could easily read a newspaper even of the smallest print.

There can be no doubt that this form of electric lighting is excellently adapted for large buildings, such as churches, cathedrals, and assembly halls, as well as for great open spaces; but I noticed that its effect on the countenances of people around me was far from pleasing, since it imparted to them an almost deathly pallor, and was wanting in that more natural glow and colour which may be maintained by the light of pure gas, where the appliances are complete and the illumination is properly diffused.

Several large manufactories have adopted the electric light, but it has not at present been applied to shops, except in one instance—namely, in the very extensive premises occupying the ground floor of the world-famous Hôtel du Louvre. Here one large window is lighted, and some globes distributed at the end of the building; but I was informed that the entire area will soon be lighted on the new system, and an opportunity was afforded me of testing the remarkable purity of the light for distinguishing even the most delicate colours. If it be true, as I am assured, that the finest fabrics may be passed, at a height of not more than 3 feet, over the apex of the globe, without sustaining the slightest injury, and that scarcely any perceptible heat is thrown off, it may be conceded that we have at least presented to us that great desideratum—a good and steady light, without those products of combustion which are alike injurious to health and to the texture and colour of articles which come within its influence.

It would be difficult to convey any very clear description of the present dynamo-electric machine, as adapted by M. Gramme to the invention of the carbon candle as perfected by M. Jablochkoff; but a small pamphlet, placed in my hands by the agent of the Company in Paris, contains some details of cost and construction which are worth attention.

The machine itself consists of the external cheeks nearly circular in form, firmly fixed together by eight cylindrical copper bolts or cross-pieces. A steel axle carries an octagonal nave, holding eight bars of the electro-magnet, and a series of small copper bobbins, rolled either on a ring of soft iron, or on a number of circular segments of the same material, are held together by an external hoop of copper. Two round isolated shields, on which rest two balais and two small discs, which are connected with the braces of the electro-magnets, complete the machine, which rests on a pedestal holding the whole structure, and the transverse brace or bar, while an outer case of polished mahogany is pierced for the ventilation of the bobbins. The balais of fine silvered copper wire, and the copper shields, serve to introduce the electric currents to the magnets, and for obtaining this current, a "continuous" machine is used, but it is possible to introduce a special bobbin, so as to produce a continuous current in an "alternative current" machine. The electro-magnet has eight simple poles, so alternated that a boreal succeeds to an austral pole, and the expanding braces leaving a small space between them, the exterior bobbins of brass, which are 32 in number, allow of 32 distinct currents, which may be reduced to 16 or to 8, or even to 4, by coupling the wires—a plan adopted at the Hippodrome and on the Place de l'Opéra.

The electric current is induced by the electro-magnet exciter being put in motion, when its iron braces, passing close to the copper spires, induce a current, the strength of which, and, consequently, the intensity of the light, is proportioned to the speed of rotation, while, as the poles of the inductor alternate, the currents produced in each bobbin change, as it were, every instant.

This alternation is, in fact, one of the secrets of the success with which the system has been applied to the carbon candle; and the carbon candle, the invention of M. Jablochkoff, is the centre of the new method of electric lighting. It consists of two round sticks or pencils of carbon placed side by side, and divided by a strip or seam of some isolating substance resembling plaster of Paris. At the apex of the candle the two pencils of carbon are connected with a narrow slip of carbon which forms a priming, which, directly the electric current reaches it, is heated to burning point, and completes the electric circuit.

The beautiful part of the invention is that, though the dividing partition between the two pencils of carbon is a non-conductor of electricity, it becomes a conductor at the point where it is fused by the heat, and the whole candle, therefore, burns steadily down, while any inequality in the rate of burning of either carbon pencil is rectified by the alternation of the electric current, which makes each slip of carbon positive and negative in turn, several times in a second. Each candle lasts about an hour and a half, and as four candles are usually placed in each globe or lantern, each has to be lighted in turn by an automatic apparatus at the precise moment before the other is burnt out. This is effected by a commutateur—a lever connected with a platinum wire—which, being released where it is in contact with the candle at the extinguishing point, causes the lever itself to communicate the electric current to the next candle in the very nick of time to continue the light without break or flicker. The supports or sockets for the candles are of onyx, or some translucent substance, and they are placed either in ground glass or opal globes, or in lanterns like those of the Place de l'Opéra.

The cost of lighting workshops, as indicated by the pamphlet to which I have referred, is stated to be 10,000 frs. (£400) for a machine suitable for 16 lights, the machine weighing about 17 cwt., and occupying a space of about two square yards. The cost of each of the candles is 75 centimes; but, as they burn an hour and a half, they may be set down at 50 centimes, or 5d. an hour each. As to the cost of general lighting, it is stated to be, for 16 lights, at the rate of 8 francs an hour for the candles, 1 franc 57 centimes for coal for the engine, 60 centimes an hour for attendant's wages, and 25 centimes for sundries, making 10 francs 42 centimes an hour. As the cost per hour for one gas-jet is reckoned at 4 centimes, and in the space lighted by an electric candle 15 jets would, it is said, be required to give a far less perfect illumination, the economy of the present system is insisted on.

At the Magasins du Louvre, where they formerly burnt 201 gas-jets a day, at the cost of 90 francs 40 centimes, they have replaced them by electric lights at a daily expense of only 63 francs 60 centimes, and with far greater illuminating power.

It will be seen, however, that the calculations depend very much on the conditions on which they are based, that nothing is set down for original cost of plant and machinery, and that the price of gas in Paris is exceedingly high.

Having regard not only to its cost but to its applicability, I am obliged to come to the conclusion that the Parisian method of electric lighting cannot be adopted in a city of irregular streets like London. Eminently suitable for large open spaces and broad thoroughfares, it is yet unsuitable both for streets of great length and for thoroughfares of limited dimensions. In the first place, the fact that the illuminating power diminishes in proportion to its distance from the machine, would make the provision of several machines extremely costly; and, in the second, the plant for lighting a short thoroughfare would also entail considerable proportionate expense. It may be, and undoubtedly is, most desirable that we should obtain pure and cheap gas, but it does not appear to me that gas can at present be superseded by the new light. Our streets are not fitted to receive the electric stations, our lamps are not necessarily adapted for lighting large spaces, except in a few instances, and the comparative prices of gas in London and the electric light as adopted in Paris forbid the innovation on economical grounds; while for culinary purposes, as a means of motive power, and for lighting private houses, gas, if it be improved, will probably hold its own for years to come.

At the same time it may be desirable to make an experiment in some of our larger areas, and I may mention that the agents of the Company have promised to communicate with me, stating on what terms they would undertake to display their system on some suitable site.

Doubtless many further improvements and adaptations may be made, or a new system of electric lighting, which will embrace the present principles, but will be effected at a much smaller cost, may be discovered; but until this is the case, the immense disparity between the expense of gas and the electric light, amounting to 400, and in some cases even to 600 and 800 per cent., will preclude the adoption of the new system for the general lighting of the Metropolis.

ON THE TESTING AND VALUATION OF GAS LIQUOR.

By Mr. T. H. Davis.

[From the *Chemical News*.]

Gas liquor, as the majority of our readers are aware, is produced as a bye-product in the manufacture of coal gas. The crude gas, on leaving the retorts, having been deprived of its tar and a portion of aqueous vapour in passing through the condensers, is conveyed through pipes to a washer, or a scrubber, the former being a vessel through which the gas bubbles, and the latter an upright tower filled with coke, over which a stream of water flows. In the passage of the gas, therefore, through either of these, it is exposed to a considerable surface of water, and by this water the ammoniacal compounds, existing in the crude gas in a state of vapour, are absorbed. This water, containing salts of ammonia in solution, is allowed to mix with that condensed in the condensers, and the whole product is called gas water, gas liquor, ammoniacal water, or ammoniacal liquor, all these terms being synonymous.

The liquor thus formed has a specific gravity ranging from 1·005 to 1·070, or even 1·100, or, in other words, from 1° Twad. to 14° or 20° Twad., and in colour varying from straw colour, through various shades, to dark brown, some samples being quite clear, and others more or less thick and turbid.

This is the liquor from which nearly the whole of our ammoniacal compounds are formed, and hence it must be considered as a valuable product, especially (as will be shown hereafter) that the compounds of ammonia, which it contains in solution are, in great part, decomposed by mere boiling, and wholly, if the liquor be mixed with lime previously. This liquor has been, and now is, in almost all cases, bought and sold on the basis of its specific gravity, or, in other words, on its degree Twaddel; but I hope to show the fallacy of this test—as has already been pointed out by my friend, Mr. George E. Davis, in a paper which he read before the British Association of Gas Managers this year—for surely the time has come when such empirical methods of testing and valuing such valuable products should no longer exist. The specific gravity of a liquor does, it is true, give a rough indication of its strength; that is, a liquor standing at 5° Twad. would be considered to be a more valuable one than one standing at 4° Twad., and less valuable than one which stands at 6° Twad.; but on examination of the table given below, it will be seen that the degrees Twaddel should not be relied on, for one manufacturer may purchase a liquor standing at, say, 4° Twad., and another, at a higher price, one standing at 5° Twad., and yet it is quite possible that the first may contain as much, or more, ammonia than the one at 5°. The following table, which contains a few results taken from a great number, will show this in a clearer manner:—

				NH_3 per Cent.						
3° Twad.			4° Twad.			5° Twad.			6° Twad.			7° Twad.
1·00	.	.	1·74	.	.	1·97	.	.	2·31	.	.	2·39
0·92	.	.	1·66	.	.	1·89	.	.	2·15	.	.	2·29
0·84	.	.	1·28	.	.	1·56	.	.	1·88	.	.	2·23
—	.	.	0·84	.	.	1·49	.	.	1·65	.	.	—

These per centages of ammonia were determined by a simple titration method which I have used for some years. I presume it is known to most of our readers, but for the benefit of those who may not be acquainted with it I have fully explained it further on.

Some companies have, it is true, made an attempt to supersede the test by Twaddel by one which is more chemical—namely, by selling the liquor on the basis of the number of ounces of sulphuric acid required to neutralize a gallon of it, the results obtained being stated as a liquor of so many ounces strength. Thus, a liquor which required 10 ounces of acid to neutralize a gallon of it would be called a 10-ounce liquor, and so on; and it happens in many cases that the number of ounces required is about twice the number of degrees Twaddel; but this rule must not in any way be depended on, although some manufacturers base their calculations on it. I have given a few results from my note-book, expressing in the first column the degrees Twaddel, in the second column the acid strength,

or number of ounces of sulphuric acid required to neutralize a gallon of the liquor, and in the third column the degrees Twad. multiplied by 2:—

Degs. Twad.	Oz. Acid.	Twad. × 2.
5·25	11·38	10·50
4·80	10·06	9·58
5·00	8·91	10·08
5·50	10·11	11·08
4·80	7·29	9·58
6·10	10·20	12·20
5·70	8·78	11·36
6·00	11·50	12·00
6·00	9·53	12·00

Here we see at once, even in this rough method, the fallacy of the degree Twaddel as giving data for a fair and proper valuation of the liquor, for, of course, the ounces of acid required represent its value in a much fairer way than does the physical test of its specific gravity.

I think I may with safety say that as long as a manufacturer bases his calculations on the specific gravity test, he must never expect them to turn out true ones.

This test, then, receiving condemnation, what test shall be suggested to take its place? It must be one that can be easily done, without much trouble with apparatus, and one that can be performed quickly. Obviously, as the ammonia is the article the manufacturer desires to obtain, it should be also the basis of the test for valuation—that is, the liquor should be bought and sold on a sliding scale, at so much per ton for each per cent. of ammonia it contains; then the manufacturer will know what he is buying, and the gas companies what they are selling. Moreover, the manufacturer will also know the quantity of ammonia he is receiving into his stock, and can work his calculations as to the quantity of finished product he may expect, whether it be sulphate or chloride of ammonia, or liquor ammonia, with confidence and satisfaction.

Now, to determine the quantity of ammonia (as NH_3) in the liquor, my friend, Mr. G. E. Davis, recommends the distillation process, which consists of boiling a certain quantity of the liquor with lime in a flask arranged in a manner well known to us all, and passing the vapours into a known volume of standard acid, titrating back, at the end of the experiment, with standard soda. This we know to be a correct test, but, unfortunately, to be correct, it requires a considerable time, each test taking best part of an hour.

Before a contract is made between a manufacturer of ammoniacal products and a gas company, this test should be carried through, so as to get at the actual quantity of ammonia to be obtained from the liquor; but I should not recommend a contract to be made embracing this test, for when each separate lot of liquor arrives at the ammonia-works, it would have to be subjected to that test in order to see that the delivery is of equal per centage to that stipulated for. Now, in large works, as I know from personal experience, many separate lots of liquor from the same or different gas-works will be arriving every day, each of which will, of course, require to be submitted to test; consequently, if the distillation process were to be adopted, the time occupied would be more than could be spared in a works laboratory.

As far as my experience shows me, the direct titration of liquor with normal sulphuric acid and calculation into ammonia would be a test sufficient to base a contract upon, and for the guidance of the manufacturer, and for all practical purposes, it may be looked upon as correct. Moreover, each test does not take five minutes, whereas, as I have before stated, the distillation process takes best part of an hour.

The titration method of testing is as follows:—Into a flask, of about 300 c.c. capacity, 10 c.c. of the sample to be tested are run, and into this 15 c.c. of normal sulphuric acid. The contents of the flask are then raised to boiling over a naked flame, a few drops of litmus added and titrated back with normal soda. The number of cubic centimètres of soda used are deducted from the 15 c.c. of acid employed, the result multiplied by 17, and divided by the specific gravity of the liquor. The result thus obtained represents the per centage of ammonia contained in the liquor. An example will make this clear:—10 c.c. of a liquor at 5° Twad. (sp. gr. = 1025), boiled with 15 c.c. normal acid, required 5 c.c. normal soda to neutralize it, consequently the sample contains 1·658 per cent. NH_3; thus—

$$\frac{(15-5)\times 17}{10{\cdot}25} = 1{\cdot}658.$$

Now as to the valuation. Suppose we consider that 10s. per unit of NH_3 per ton to be a fair value, then the above sample would be worth $1{\cdot}66 \times 10{\cdot}5 = 17$s. 5d. per ton. Of course, I do not wish to fix any price as the standard for valuation—that must be a matter of arrangement. Such a system would induce gas managers to make the liquor as strong as possible, and ammonia manufacturers would do well if they were to refuse a contract for liquor containing less than 1 per cent. of NH_3; for if below this—unless the liquor were given them—they would barely clear the expenses of manufacture.

I trust this paper will cause other chemists who have had experience in the matter to express their views on the subject, for I cannot but think that all such would be glad if such rule-of-thumb methods as are now employed in this branch of chemical manufacture were abolished.

ON THE WORKS PROJECTED AND UNDERTAKEN DURING THE LAST THIRTY YEARS FOR THE SUPPLY OF THE PRINCIPAL TOWNS IN THE COUNTY OF STAFFORD WITH WATER.

By Mr. Henry J. Marten, C.E.

[Abstract of a Paper read before the Sewage Utilization and Water Supply Section of the Sanitary Institute of Great Britain; Stafford, Friday, Oct. 4, 1878.]

The paper commences with a general description of the physical features of the county, which extends over an area of about 1130 square miles, or nearly three-quarters of a million acres, and it is remarked that owing to its central situation its surface is of considerable elevation above mean sea level, and that, whilst it possesses no mountain ranges, it is traversed from north to south near its western boundary by the high land constituting the great watershed of the country, which divides the drainage areas of the great river systems of the Trent and the Severn. The land lying to the east of the watershed, which embraces the great bulk of the county, constitutes the upland drainage-grounds of the Trent and the Tame. With regard to its geological features, in round numbers the new red sandstone formation occupies three-quarters of the whole area of the county; the North and South Staffordshire coal-fields, one-eighth of its surface; and the remainder consists of the millstone grit, limestone, and basalt rocks. Thirty years since the population was about 600,000, whilst it now numbers very little short of a million, dwelling in about 200,000 houses.

The author observes that the county yields no record whatever of ancient works of any magnitude for the supply of water for domestic purposes—a fact that perhaps may be accounted for by the large development of the new red sandstone formation in the county, from which a good supply of water could be obtained for the then comparatively sparse population, by means of shallow wells sunk into it adjoining each group of dwellings. The earliest record of the efforts of the forefathers of the county for improving the domestic supply is found in the instance of the city of Lichfield, when, in the year 1301, a certain Henry Champanar, a bell-founder, carrying on his business there at that time, gave his springs at Aldershaw, first for the supply of the house of the Minor Friars there, and then for the supply of certain conduits or well-heads in the city. At the breaking-up of the monasteries in the time of Henry VIII., these springs were made over, in the year 1545, to trustees, for the benefit of the town, together with lands for their maintenance, which have recently so improved in value, owing to minerals having been found under them, that the trustees have been able, under the advice of Mr. Hawksley, C.E., to carry out a very complete system of water-works, by which the town is amply supplied with water at a considerable pressure, and under the constant system. With regard to this trust, the author remarks that its history reflects great credit on the integrity and ability of no less than 17 generations of the leading men of the city of Lichfield, who for a period extending now to 577 years have, amidst all vicissitudes, judiciously managed it—an instance which he considers to be a standing testimony to the persistent vitality of institutions established among us for the public benefit.

Following the order of antiquity, the paper then gives a short account of the Cannock Water-Works, erected by voluntary subscription in 1736, when a "Dr. Byrche gave a spring of water rising in his Leacroft meadow for the benefit of the inhabitants for ever." At that period the town of Cannock—now the centre of an active and increasing mining population—was of great resort as a fashionable watering-place, on account of what was denominated the salubrity of its springs. The works were of a very simple character, consisting of a collecting-tank and small main into the town, by which means the water was distributed to half a dozen pumps. The works have remained to this day without any material alteration, though now, after having unobtrusively administered to the necessities of four generations of the inhabitants of Cannock, they stand in great danger of passing into the practical oblivion prepared for all things that do not keep fully abreast with the times, for, in 1875, the South Staffordshire Water-Works Company obtained powers to supply the town and all the surrounding districts, and it will be difficult for it to hold its own against so gigantic a competitor, abounding with capital and all the modern appliances of hydraulic science.

Nearly 100 years elapsed, after the completion of the Cannock Water-Works, before any further effort was made in the county, when, in the year 1834, the Dudley Water-Works were established to supply that town and Bilston and Sedgley with water. This Company obtained their supply from neighbouring gathering-grounds, and a spring, which, in process of time, became so polluted by increasing population and reduced by mining operations, that, after an effort (which proved only a temporary expedient) to obtain an increased supply from some old limestone workings, the Company, in the year 1861, transferred their works and interest to the South Staffordshire Water-Works Company, who at once discarded all the sources whence the Dudley Company derived their supply, retaining only as part of their system the summit reservoir and the distribution pipes laid throughout the town, which they charged from their own sources of supply.

The paper then refers to the Wolverhampton Water-Works, established under parliamentary powers in 1845, with a capital of £26,000. These works were constructed from the designs of the late Mr. Thomas Wicksteed, C.E., who, as the Engineer of the East London and several other Metropolitan Water Companies, as well as numerous provincial ones, enjoyed a high reputation as a hydraulic engineer. It was owing to his energy and perseverance that the Cornish pumping-engine, with all its great economies, was first introduced for water-works purposes. The author, then a pupil of Mr. Wicksteed, acted as Resident Engineer, and, subsequently, as Engineer to the Company. The works, as originally designed, consisted of a well sunk into the sandstone rock at Tettenhall, a village two miles to the west of Wolverhampton, whence the water was pumped over a stand-pipe, and delivered in the town on the intermittent system, of which Mr. Wicksteed was a great advocate, almost going to the extent of saying that any other system was both absurd and impossible. The works were started in 1847, and vigorous efforts were made for two years to induce the inhabitants of Wolverhampton to put up with all the miserable inconveniences of that system, but with so little success that, out of 7000 houses within the Company's parliamentary limits of supply, the inhabitants of only 600 could be induced to take the supply on those terms. The Company were then advised by their Engineer to adopt the constant system, when, in one year, the number of customers was increased threefold, and the consumption reduced more than 20 per cent. At this period, the controversy between the adherents of the intermittent and the constant supply systems was raging with considerable acrimony, and the adherents of the old method, being very considerably in the majority, were not very polite in their observations with regard to the advocates of the new system. At this juncture, Mr. Robert Rawlinson, C.B., then one of the Inspectors under the Board of Health, reported upon the circumstances connected with the change of the system of supply in Wolverhampton, and they were further inquired into by Mr. Edwin Chadwick, C.B., the Secretary to the Board of Health, the great point being to ascertain the actual rate of consumption under the constant system at every hour of the day, the opponents of that system having broached the theory that, to afford a constant supply, the mains and service-pipes must all be of sufficient capacity to supply the whole of the consumers at one and the same moment. This extraordinary hypothesis was gravely put forward to show the enormous expense which would necessarily be entailed in the event of any so-called mad attempt being made to supply the Metropolis on that system. The Wolverhampton Water-Works at that time presented unusual facilities for testing the question, because the engine pumping over a stand-pipe, and always by that means keeping the mains full, an exact register could be kept of the quantity of water actually drawn off at each hour of the day, and, at Mr. Chadwick's request, the author entered upon a series of experiments, now nearly 30 years since, to test this point. The experiments showed that, so far from the mains and service-pipes being required to be of a capacity to supply all the customers at one and the same moment, they need only be of a capacity to deliver a maximum flow at the rate of two and a half times the average daily demand, and constant supply practice has since been founded upon these results. These facts very soon exploded the extraordinary theories and assertions of the advocates of the old intermittent system; and when, subsequently, he had to verify them before a Parliamentary Committee on the Water Supply of the Metropolis, with which the late Sir James Graham was connected, that astute statesman declared that the Wolverhampton facts (as they were called) had convinced him that the system of constant supply was quite feasible to the Metropolis. Since that time successive Governments have taken the matter in hand with a view to secure that system of supply for the Metropolis, and although considerable advances have been made in that direction, the crowning effort by which the Metropolitan Water Supply is to be placed upon a footing of equality with the more favoured provincial towns has yet to be made.

The rate of progress made under the constant supply system soon so

extended the demands upon the Wolverhampton Water Company, that it became necessary for them from time to time to seek further parliamentary powers, with respect to which, and the various extensions consequent upon them, the paper supplies many interesting details. In 1856 the original Company were merged into a new Water Company, who derived their supply from the River Worf, nine miles from Wolverhampton, for which purpose extensive works were carried out by Mr. F. J. Bateman, C.E., whilst in 1868 the rights and interests of this Company were in turn purchased by the Corporation of Wolverhampton, by whom they have been, and are, successfully carried on under the management of Mr. Lyons Wright, the Engineer to the Corporation. At the time of the construction of the pumping-station at Cosford, a bore-hole was sunk, under Mr. Bateman's superintendence, into the sandstone rocks there for a depth of about 260 feet from the surface of the ground. This hole was 12 inches in diameter for the first 70 feet, and the remainder 7 inches in diameter. At the time of its completion this bore-hole yielded by artesian force a quantity of water estimated by Mr. Bateman at 260,000 gallons per day. In March, 1876, the Corporation decided to sink a deeper and larger bore-hole—a work the carrying out of which they placed under the writer's superintendence. This hole was carried to a depth of 918 feet from the surface of the ground, being 24 inches in diameter for the first 534 feet, and the remainder 15 inches in diameter. The rocks penetrated consisted of the upper soft red rock, the pebble bed formation, and the lower soft red rocks, the latter being penetrated for a distance of 70 feet. In the course of the boring operations, the breccia forming the foundation of the pebble bed rocks was found to be 130 feet thick, and so hard that it took 2000 blows of the heavy cutting-bar, weighing nearly a ton, and falling 5 feet at each blow, to penetrate through one foot of it, and great doubts were expressed whether the lower soft red rocks would be found lying below the breccia bed. The Corporation, however, decided to persevere with the work, and they were rewarded by ultimately tapping the lower soft red rocks, thus bringing within reach of their engines the copious supplies of fine water contained therein.

The flow from this bore-hole is as under:—

	Gallons per Day.
When overflowing at the surface of the ground the yield is	480,000
When pumped to a depth of 9 feet below the surface of the ground the yield is	830,000
And when pumped at 26 feet below the surface of the ground the yield is	1,420,000

The cost of this boring was about £4000, including a double-beat self-acting valve for regulating the flow of the river water into the tank in which that and the spring water are mixed prior to being pumped.

The capital now expended upon these works amounts altogether to £230,000, producing a gross revenue of nearly £20,000 per annum. The number of houses supplied in Wolverhampton and Willenhall is 17,186, and there are about 4500 houses in Bilston supplied with water purchased in bulk from the Corporation of Wolverhampton, and distributed in detail by the Local Board of that town, thus making a total of 21,686 houses, or a population of 120,000 persons, now supplied by the Corporation works. The quantity of water supplied is about 2 million gallons per day on the average, showing a consumption of about 17 gallons per head per day. Of this supply about one-half consists of sandstone water, and the remainder is river water. The water is on the average from 12° to 13° of hardness, and contains about 20 grains of solid matter to the gallon. The great bulk of the water is forced for a distance of nearly eleven miles, and to an elevation of over 400 feet above the site at which it is obtained.

The cost is as under:—

	Per 1000 Gallons.
Engine expenses and repairs	1·20d.
Coals	1·20
Cost of distribution, salaries, &c.	1·50
	3·90d.
Interest on capital	4·35
	8·25d.

The works are a credit to the town, and are well and economically managed, in proof of which it should be mentioned that, at the time when these works were taken over by the Corporation, there were many who considered that the Corporation had made a very improvident and injudicious bargain for the ratepayers. The result has, however, fully endorsed the far-seeing judgment of those who urged the Council to undertake the purchase, for the works have not only never been any burden to the ratepayers—the ordinary revenue from the undertaking having from the first been sufficient to meet all interest and charges upon them—but, at the present time, after meeting all such payments, there is a clear profit accruing of about £2000 a year, which capitalized represents a property worth at least £50,000 over and above all liabilities. Such is the successful position of the Wolverhampton Corporation Water-Works.

The paper then proceeds to describe the South Staffordshire Water-Works, which had their origin in the reports, setting forth the lamentable state of that district as regards water supply, which were from time to time issued by the Board of Health prior to 1851, in which year the author, on the one hand, and the late Mr. M'Clean, C.E., M.P., on the other, both introduced schemes for improving the supply. In each case parliamentary plans were deposited, but local influences prevented either scheme from being carried out, and in the ensuing year an arrangement was made by which all influences were amalgamated, and Mr. M'Clean and the author were appointed joint engineers to report upon the best means of supplying the district. After carefully considering all the sources of supply within a reasonable distance, they reported that, in their opinion, the best were to be found in springs and streams in the neighbourhood of Lichfield. The report was adopted by gentlemen interested in the work, and resulted in the South Staffordshire Water-Works Act of 1853. By this Act the Company were authorized to raise £160,000, and after some delay, caused by the difficulty of raising the required capital, the works were finally opened by the Earl of Dudley in October, 1859. Since that time the demand, though slow at first, has been gradually increasing and extending, until by successive additions to their parliamentary powers they now embrace a district covering an area of 250 square miles, and extending from Burton-on-Trent, in Derbyshire, on the east, all over South Staffordshire to Halesowen, in Worcestershire, on the west. The population within the Company's limits is not less than 500,000 persons; the capital expended by the Company is about £730,000; the number of houses supplied is 81,000, from which, and from large supplies for trade purposes, a gross income of £43,000 a year is now derived, whilst the quantity of water pumped into the district by the Company is between 4 and 5 million gallons a day, which is forced through cast-iron main-pipes an average distance of from 12 to 14 miles, and to an elevation in some cases of 500 feet above the source of supply. The paper supplies many other interesting details as to the progress of the works, and states that great credit is due to the Company for the skill and perseverance with which they have met the increasing demands upon them, whilst they have a large field for future extension, as up to the present time only about one-third of the population of their district actually takes the supply.

Then comes a short account of the Stourbridge Water-Works Company, established in the year 1854, the works for which were carried out from the designs and under the superintendence of the author and his brother, Mr. E. B. Marten, C.E. The Company procure their supply from a well sunk into the sandstone rock, whence the water is pumped to an elevated covered reservoir. The capital expended is £21,000, and a supply of 400,000 gallons per day is afforded by it to about 3000 houses. The Company are about to increase their capital and extend their works to meet enlarged demands.

Following this is a description of the Crewe Water-Works, established by the London and North-Western Railway Company. Crewe—the population of which in 1841 was under 400, and which at the last census numbered 18,000—is, as is well known, the creation of that Company, owing to their having fixed upon this spot as the seat of the workshops for the northern division of their system. The youthful town was at first supplied from an impounding reservoir, but the land being required for an extension of the railway works, the Directors of the Company applied to Professor Hull, F.R.S., then connected with the Geological Ordnance Survey of the Midland Counties, and now the head of the same department in Ireland. Under his advice they sank a well into the conglomerate formation of the new red sandstone at Whitmore, about eleven miles distant from Crewe, from which an abundant supply of water has been obtained of so pure a quality, that Mr. Ramsbottom, late Superintendent of the Locomotive Department of the Railway Company, pronounced it to be the best supply in their whole system.

Turning his attention to the north of the county, the author next gives a description of the Staffordshire Potteries Water-Works, established in 1847, with a capital of £60,000, by which a supply of fine water was brought into that district from springs at Wall Grange, a spot in the Churnet Valley, seven miles east from the town of Hanley. The water of these springs is pumped by means of two powerful Cornish engines to a reservoir situated at Ladder Edge, adjoining, but at an elevation of 300 feet above, the springs, whence it flows by gravitation to a distributing reservoir situated near Hanley, and whence it is supplied to that and other towns in the locality. In 1849 the Company purchased the water-works then supplying Fenton, and belonging to the Duke of Sutherland, and, by further powers conferred upon them from time to time, they have provided for the increasing requirements of the district by an expenditure of £235,000, by means of which outlay they can now supply nearly 4 million gallons of water per day to a population of 200,000 persons, dwelling in 33,000 houses, and for which service they receive a gross revenue of about £24,000 a year. The works were designed by the late Mr. Liddle Elliott, aided by the late Mr. James Simpson, C.E. (Engineer to the Chelsea Water-Works Company), as Consulting Engineer; but for the last few years they have been under the superintendence of Mr. G. D. Harrison, C.E., who has effected considerable improvements, having in that time converted a partially intermittent into a practically constant supply, at an expense to the Company of only 2s., and to the consumer of only 4s. per house supplied. He has also very ingeniously utilized the microphone as a waste water detector.

The Cheadle Water-Works are next described. They were established in 1854 with a capital of £6000, and by means of them the town is efficiently supplied, on the constant system, with a consumption of from 10 to 12 gallons per day per head supplied—a consumption which, from its small average as compared with other towns, indicates that great care is bestowed upon the fittings, so that little waste occurs.

Reference is then made to the works now in contemplation for the supply of Tamworth and the surrounding district, and particularly to the great facility afforded for obtaining tests of the quality of underground sources of supply by means of the Abyssinian tube-well system, which the author employed in researches in the neighbourhood of Tamworth with great advantage.

The author does not enter into particulars of the water supply of Stafford—as that is made the subject of separate papers, excepting so far as to remark that the Corporation had evinced a great desire to obtain a good supply of water, and that they were now actively prosecuting works with that object, for which purpose they had already laid mains throughout the town, and had sunk a bore-hole some 900 feet deep through the marl measures, but without at present having obtained a supply of water. Entertaining an opinion that this site would turn out disadvantageously, so far back as December, 1876, he endeavoured, without success, to induce the Corporation to abandon their intention of boring there, and recommended them instead to sink a well into the conglomerate measures at Berkswich, on a piece of land which, at his request, the Earl of Lichfield had kindly consented to place at the disposal of the Corporation for that purpose. But, whilst the Corporation at that time rejected his advice, the London and North-Western Railway Company, who required a supply for their station at Stafford, so far availed themselves of it as to sink within a short distance of the spot indicated by him, and where they have obtained an abundant supply of very excellent water at a short distance below the surface of the ground.

In conclusion, the author remarks that, from the foregoing facts, it will be noted that during the last 25 years the authorities charged with the supply of water to the principal towns in the county have judiciously expended for that purpose over £1,250,000, or at the rate of £1000 per week, during the whole of that long period. This money—now yielding a gross revenue of over £90,000 a year—has been expended in the purchase of high-class pumping machinery, reservoirs, mains, and subsidiary pipes, ramifying into every nook and corner of the principal towns of the county, and maintained for many hundred miles over mining ground. Thus, by means of these works, a supply of nearly 12 million gallons of water per day is pumped for distances of nearly 12 miles on the average, to elevations of from 300 to 500 feet above the source of supply, and by means of which one-half of the total population of the county, dwelling in upwards of 94,000 houses, is actually supplied, whilst a great number more have the supply brought to their doors, although at present they have not availed themselves of it. He also observes that by means of these works many trades have been made possible that otherwise could not have existed, and that though occasional errors in judgment may have been made in the design and execution of these great sanitary works, he trusts that those who have borne the financial burden entailed in establishing them, as well as those who have endured the labour of carrying them out, may be deemed to have deserved well of their county and of the Members of the Sanitary Institute of Great Britain.

Appointment of a Gas Manager at Chorley.—On Thursday, the 10th inst., the Chorley Improvement Commissioners held a special meeting to appoint a gas manager, in place of Mr. T. Hamer, resigned. Out of 76 applications received, six were selected by the Gas Committee for the Commissioners to choose from, and their selection eventually fell upon Mr. Francis W. Brothers, of Pleasington, near Blackburn.

THE ADMINISTRATION OF THE PUBLIC HEALTH LAWS.

By Mr. E. B. Ellice-Clark, C.E.

[A Paper read at the Autumn Congress of the Sanitary Institute, held at Stafford, Oct., 1878.]

Great, if not insuperable, are the difficulties experienced in administering the Sanitary Laws. To the general public who know that 30 years ago a Public Health Act was passed, and legislation has been active on the subject ever since, it will be a matter of surprise to learn that, in a majority of towns and in nearly all rural districts, the Sanitary Laws have hitherto proved comparative failures, for the normal death-rate of England is as high in 1878 as it was in 1848. Nor is the cause of this difficult to find. Probably no series of laws ever passed by the Legislature have interfered with the rights and privileges of property to such an extent as these Acts; therefore, when we find they have to be administered by what may be termed a voluntary permissive, instead of an absolute executive, it is not surprising to find that little progress has been made after more than a quarter of a century's work.

The permissive character of the Public Health Act places a power of inaction in the hands of those who are pecuniarily or otherwise interested in the *status quo*, which it is time should be removed for one of absolute authority. Those who have watched the actual progress made in giving people the essentials of a healthy and long life in cities have not failed to be struck with the slight advance made during the past 20 years to secure these. Towns are still undrained, having acres of filth beneath the houses; streets are unpaved. In the heart of the very Metropolis itself houses are so badly built as to come tumbling about their owners ears; hundreds and thousands of filth-reeking dens, unfit to be the resort of animals, still less the homes of mankind, cumber the earth in all our large towns, and too frequently are to be met with in the smaller towns and rural districts; and, notwithstanding the fact that Parliament considered the then evils so great as to pass an Act for their amelioration in 1848, not only do the same insanitary conditions exist, but others have grown, and are growing up every day, as bad as, if not worse than, those pointed out by the Health of Towns Commission.

Streets that in no case should be less than 40 feet in width, in more than one of our greatest cities may be made 20 feet in width. Walls for dwellings that in no case should be less than a brick thick, in scores of towns are built half a brick thick only. Cesspools and privies that sanitarians so loudly denounced 40 years ago are being excavated, and used at this day in the heart of many densely-populated towns. Back-to-back houses, without air spaces at the rear or sides, as required by bye-laws innumerable, are being constructed; and it is within the mark to say that the very evils pointed out so vividly by Mr. Chadwick and his co-workers so many years ago, exist, more or less, in all their stages of rottenness, in nearly all the great centres of population throughout the kingdom, when we except about twelve of the drained and water-closet towns. In many of the former no really sustained effort has yet been made to carry to a conclusion the intentions of the Legislature.

It is a matter much to be regretted, but none the less true, that, excepting the above-mentioned twelve towns, the majority of the members of the various sanitary authorities are not drawn from the classes having a sufficient and appreciative knowledge of the evils around them; nor have they the independence and ability so necessary to an administrative executive when discretionary powers, such as we find under bye-laws, are placed in their hands. It was anticipated, when Local Boards were first formed, that parochial business would receive an impetus which would raise it from the level into which it had sunk—that men would be attracted as candidates who would fearlessly carry out the reforms so urgently needed; but such has not been the case. In many towns a great show has been made, and much money spent; for instance, towns have been sewered, but when persons have objected to connect their houses therewith, no one has had the courage to put the law into force to compel them. As the type of a town where the Sanitary Acts have been so great a failure, the writer may cite a city, having a population of 80,000 souls, where the Act of 1848 was adopted in 1852. Bye-laws were passed for all the matters that local authorities have to control, officers were appointed, main sewers were constructed, and all the machinery for securing the inhabitants healthy houses to live in, factories to labour at, and streets to walk through, was put in motion, only to stop within a few months. Almost directly the authorities came to administer the laws, they found themselves and their neighbours at open war, and the thought of the next November election was sufficient to deter them from interfering further with sanitation in its public action. The dead-lock has prevailed ever since. Twice only have offenders been brought before the justices for breaches of the building bye-laws, and nearly 3000 houses have been erected in defiance of their existence. The party-walls were specified to be 9 inches thick in the bye-laws, but 4½ inches of badly-burnt clay, facetiously called brickwork, intervenes between each dwelling; this, instead of being carried through the roof, terminates at the bed-room ceiling—the latter plastered in mud for the hour, very soon falling off, giving ventilation into the roof of the entire row, and, in the case of an epidemic, providing a flue for the conveyance of disease germs from house to house. The main sewers, admirably constructed a quarter of a century ago, are still without ventilation, and serve the purpose of carrying away slop and rain water only; for side by side with the jerry wigwams, termed, with a spirit of irony by the local auctioneers, "that eligible dwelling-house," is found the open privy in the most confined parts of the town—not by the score but by the thousand—in hundreds of cases not 3 feet from the living-rooms, in a great number the walls for the reception of the filth being the lower part of the dwelling-house walls. Water, being a commercial article of necessity from which a net profit of 10 per cent. on capital can be made, is well supplied; the company having this work in hand being alone in doing their duty as a sanitary body. Densely inhabited courts, unpaved, with every nook and cranny occupied—with all these filthy appendages without, and, still worse, within—can be found within ear-shot of the Council Chamber, where the Sanitary Authority holds their meetings.

The main commercial streets of the town have been widened, and a grand and lofty market-place, erected at immense outlay, rears its head above any other edifice in the town, where—in parentheses let it be named—a costly iron roof, 80 feet high, has been constructed for the purpose of sheltering the vendors of carrots, bacon, and old books; but not a penny piece has been expended in sweeping away the courts entered from the almost equally narrow streets, under low archways, with the typical row of open privies staring you in the face as you enter, and many more of the kindred evils which fall on a neglected population springing up at every footstep. Year after year goes by; fortunes are made by the magnates who rule the town, but no man makes a lasting effort to remedy the evils, or, if he does, receives his *quietus* in November, and the "cold shoulder" of his brother Councillors.

The Sanitary Authority have met for a quarter of a century. Their Sanitary Committee—whose Chairman and a majority of the Members are the owners of the courts, or who have friends who are—have sat in solemn deliberation two thousand sittings, and yet no sign of a change takes place. No; nor will it, until a different class of men sweep them away from their stools of culpable indolence and negligence—not until the law of the land is compulsory, and men are appointed to see it executed.

It will be asked, But why does not the Town Surveyor, or the Medical Officer, or the Sanitary Inspector, expose these evils? Alas! the former holds his situation by a tenure as weak as a web, that can be broken by the very men who perpetuate these abominations; for they are the administrators of the law, and the givers and takers of offices. The Surveyor is underpaid and overworked, and knowing the result of his spreading broadcast the state of the town, a seal is set upon his lips. The Medical Officer is a general practitioner, receiving £50 a year for his public work, that is honestly worth £500; whose heart ached at the sights he saw for the first time when appointed, though he was bred and born in the town; whose reforming spirit entered into the office with the ardour of an enthusiast; but the *vis inertiæ* has sobered him down to the stern reality that the principal members of the Sanitary Board, who hold the keys of his office, are themselves the *genii* of filth; and, although half his salary is paid by the Imperial Exchequer, which gives him an appeal to the Central Authority in London, such is the nature of social life in England that, were he to denounce the sanitary evils that dog his steps every hour, his private practice would be gone.

This is but one phase of the administration of the Sanitary Laws in urban districts. It is sufficient to have one evil under consideration at a time, otherwise there are many and grievous wrongs permitted and perpetrated by similar bodies, which require amending. The first work of Sanitary Law reform should be to supersede the permissive action of Local Authorities for one of compulsion. Bye-laws could be made for all the purposes of local government; and if Sanitary Authorities were compelled to make these, a great step would be gained.

The next point would be to see that these laws were carried out; and while we have unprotected local officers, it is impossible to expect they can take the initiative. Therefore, the Local Government Board should appoint inspectors to visit each town to see that the Sanitary Laws were actually at work. It is the case with coal-mines, alkali-works, and lunatic asylums; and if every Town Council knew that an official report from year to year of the state of their district would appear, it would stir them to activity at once. Inquiries are now held after disease has broken out, and before money is borrowed for public works, but no inquiry is made as to whether or not the money borrowed is properly applied.

The Sanitary Acts are meant to be preventive. That they have not been so let the death-rate tell.

To those authorities who do their duty, as many do, it would be a pleasure to have a report of the progress they are making, and the only possible objectors would be those who notoriously neglect their duties.

How better qualified members are to be obtained for Sanitary Boards is a difficult question; probably they will not be until public opinion is more enlightened as to the class of men that should represent them. Then we may hope to see high-minded, impartial, educated, men filling the seats of Local Authorities. To educate the people in sanitary matters is the main object of this Institute. Successful administration must rest on the broad base of the people themselves, and it is to be hoped by disseminating sanitary knowledge this Society will in time bring about a public demand for active, honest administration of the Public Health Laws.

GAS SHARES, GAS COALS, AND THE ELECTRIC LIGHT.

[From the *Newcastle Daily Chronicle*.]

The holders of gas shares are once more beginning to feel reassured. The influence of panic has subsided, and though there is still some uncertainty and a little uneasiness, there is by no means the same widespread desire immediately to sell out. The fact is that, although there was some reason to fear that gas might be superseded in some of its uses, there was no justifying cause for such excitement as prevailed. Some degree of panic, however, was not very unnatural under the circumstances. We seem to have arrived at one of those epochs in history when "knowledge grows from more to more" with a rapidity which surprises dull persons into breathlessness. Recently one discovery has trod so closely on the heels of another that incredulity, which is sometimes the most comforting of all feelings, has quite broken down under the strain that was placed upon it. "After this there is nothing wonderful" appears to have been the mental ejaculation of large numbers of good people who were suddenly startled out of the hallucination that science was capable of no more surprising applications. Hence it was natural that many persons, who were deriving a comfortable income from the high per centages of gas companies, should be a great deal frightened when they heard that the electric light was being so much experimented with, so much divided and sub-divided, that it might soon be used to light up our factories, our workshops, and even our parlours and drawing-rooms. Now that the public excitement is calmed, and the feeling that such great things are not done all at once is asserting its way, there seems likely to be a reaction from panic to over-confidence. One high authority, who has written a pamphlet for the comfort of the holders of gas shares, grows quite satirical about the electric light, and observes, in relation to gas companies in general, that "threatened men live long." This matter, however, is not a subject for irony any more than it is a reason for excessive alarm. The triumph of electricity in some departments has now become tolerably certain. It has not been proved with the same conclusiveness that it will very considerably diminish the consumption of gas.

What chiefly gave rise to the panic, which is now almost over, was the fact that experiments with the electric light had become almost universal. Every electrician and every dabbler in electricity was conducting investigations on his own account, and with the general result of making electric lighting more feasible and practical. That the rage for experiment should have risen almost to a mania, has caused a considerable degree of surprise; yet it is merely the working of one of the most ordinary laws of political economy. Gas shares have been exceptionally good investments. Companies have been paying, in most cases, 10 per cent. It was absolutely certain that, if this continued long, there would be a bid, from some direction, for a share in these large profits. What suggested itself readily enough was a substitute for gas; and so experiment begot experiment, until we now appear to be on the eve of solving the problem as to the general use of the electric light. It must be said on behalf of the gas companies that they have not been frightened into inaction. The two largest companies in the world were acute enough to see that, even if electricity won the contest, public lighting might still remain in their hands. They have accordingly been for some time conducting independent experiments which may lead them to a result at once profitable to themselves and satisfactory to the public. Whether lighting by electricity shall be contracted for by companies depends, however, on some yet unsettled considerations. The authority to whom we have previously referred, says: "The promoters of the electric light state that, if they are able to bring it into some commercial shape, they wish to avail themselves of gas as a motive power. If they do that, and they consider it the cheapest, I think it would require almost as much gas to work it as the consumer would require for lighting his own premises." The inference is somewhat too hasty; but the thing of real importance is, that here is a distinct use for gas, and if the companies supply power for the gas-engine, they may supply the electric light as well.

A curious consideration, which arises out of the probable adoption of a

system of electric lighting, has scarcely obtained the attention which it deserves. Should gas be superseded in some of its chief uses, one branch of the special industry of our immediate neighbourhood may just possibly be paralyzed. Much of the coal sent out from this district is gas coal. Some collieries produce nothing else. It is easy to perceive that, under special circumstances, there might be a total revolution in the local coal trade, and this would naturally extend its influence to shipping, and otherwise seriously impair the commerce of the Tyne and the Wear. This is putting the worst complexion on a state of matters which is at least just possible of being realized. In human affairs in general, however, the reasonably hopeful view is the one which is most frequently justified in the end. There are compensations everywhere. The producers of gas coal have the same reasons for comfort that will in time present themselves to the gas companies. The demand for gas does not diminish; it increases. This adaptable servant of mankind is being continually put to new uses. Gas-engines are becoming common. The influence of the South Kensington example is gradually rendering more general the practice of cooking by gas. In every direction gas is being applied to purposes which it has never previously served. It is to be doubted whether anything will really supersede coal and its most useful product. Gas is so serviceable, so adaptable, so easy of application to a variety of purposes, that, although electric lighting is the dream of the immediate future, it is tolerably safe to conclude that gas will always be in general demand.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The slight improvement which was noticeable in the coal trade of this district, at the commencement of the month, has only been of a very temporary character, and seems now to have entirely disappeared. The demand for house-fire classes of fuel has altogether fallen off, and this branch of trade is just now unusually dull for the season of the year. In gas coal, although the purchases for anything like immediate delivery have been comparatively small during the summer months, there is very little doing for present requirements, and even the inquiries which had been put in the market for very long forward deliveries, extending in a few instances over the next four or five years, have, in some cases, been withdrawn, owing, probably, to the uncertainty with which some of the gas companies regard the future results of the development of the electric light. Common classes of coal, in consequence of the large quantity of machinery now standing idle in this district—as the result of the general stagnation in the iron making, cotton manufacturing, and other local industries—is a complete drug in the market, and sales for cash are forced by needy holders at extremely low figures, buyers who are able to take large quantities for shipment being able to cover their requirements at prices which are lower than have been known in this district for years past. The quoted rates at the pit mouth are, however, without material change, and may be given about as under:—Best Wigan Arley, 9s. 6d. to 10s.; seconds, 8s. 6d. to 9s.; common, 7s. to 7s. 6d.; Pemberton four-feet, 6s. 6d. to 7s. 6d.; ordinary screened gas coals, 6s. 6d. to 7s. 6d.; common coal, 5s. to 6s.; burgy, 4s. to 4s. 6d.; and slack, 3s. to 3s. 6d. per ton.

The iron trade has been extremely dull during the past week. Lancashire makers of pig iron are doing little or nothing, and, although outside brands have been pushed at very low prices, buyers have been very difficult to find. Manufactured iron is still without material change; the quotations for bars delivered into the Manchester district remaining at about £6 per ton; but works are very badly off for orders, and another reduction in wages is talked of.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There have again been complaints of a lack of ready sailing tonnage, and last week there were rather more orders for gas coals in the market than there were ships, say of about ten keels each, to take them to the large ports. Tonnage has been wanted for Ireland, and more could be taken up for the north of France if ships were available. Generally speaking, the gas coal trade was very little altered last week. Prices were about the same. There is not much anxiety in the North with regard to the effects of the electric light upon the gas trade of the future. Of course, any alteration in the gas trade would very materially affect a large amount of colliery property in the county of Durham, which produces gas coals exclusively. First class gas coals are sold at 7s., and second class at 6s. net. Second class gas colliers are rather in excess of the requirements of the trade, and some of them do very badly; for, as a rule, shippers prefer taking the best. Other branches of the coal trade are quiet. Prices are low. Second-class steam coals continue to be closed through the bad times.

The freight market is dull; it favours the shippers. The rise and fall rarely exceeds 3d. to 6d. per ton, however. Shortly steamers will come into the coasting trade from the Baltic, so it is not likely that freights to London and the South will get much beyond what they are this winter.

The general manufacturing trades of the North are without animation. Business is being restricted within the narrowest limits. There is a general impression that trade is very sound here. There is no panic or failures as in other parts of the country, though there is a good deal of anxiety. In the lead market of the Tyne, pig is sold at £16 10s., dry white lead £22 10s., red lead £17 10s., and flake litharge, £18 10s. per ton.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The announcement, in the last issue of the JOURNAL, of the death of the Editor, Mr. W. B. King, has been received, amongst gas managers and other persons interested in gas affairs on this side of the Border, with very deep regret, more especially by those who had his personal acquaintance, or had come into contact with him at meetings of the British Association of Gas Managers, or in committee rooms of the Houses of Parliament. His influence, in connection with the science and practice of the manufacture and distribution of gas, will long be felt by the gas world, and by no persons more than those who have had the privilege of perusing the weekly budget of professional literature, with which they have been supplied in recent years through the great ability and tact of the deceased.

At the last meeting of the Burntisland Town Council it was reported that the North British Railway Company were now prepared to dispose of their gas-works to the burgh; but that they did not accept the offer made by the Burgh Authorities, which the latter considered had embodied reasonable terms.

The villages of Mossend and Bellshill, both of which are in the Motherwell district, and are very largely engaged in the coal and iron industries, have just had their streets lighted with gas for the first time.

Again the question of removing the Edinburgh gas-works from their present site into some suburban district, and the acquisition of the gas-supply undertakings by the Municipal Authorities is receiving consideration.

At the monthly meeting of the Broughty Ferry Police Commissioners, held last Monday, it was resolved to fix the price of the gas at 4s. 7d. per 1000 cubic feet, with 5 per cent. discount for payment within 21 days, and at a proportionate rate to consumers outside the burgh. These rates are the same as were charged during the past year.

Hitherto the village of Kilmalcolm has had its public street lighting maintained by voluntary subscriptions; but it has just been resolved by a meeting of the ratepayers to petition the Gas Company to undertake the responsibility of lighting and maintaining the public lamps, and to assess an additional sum on the gas consumers to meet the expenditure.

The statement of accounts for the Renfrew Corporation Gas-Works, for the year ending 30th of September, has just been published. On the revenue side there was received for gas sold £1243 13s. 6d., together with £63 3s. 2½d. for meter-rents, and £189 10s. 6d. for gas supplied for the street lamps. Including the receipts for secondary products, &c., the total revenue was £1655 8s. 3½d. About £700 was spent for coals, and the other outlays brought the total expenditure up to £1472 14s. 8½d., thus giving, as surplus revenue, a balance of £182 13s. 7d.

Following up the resolution come to some time ago, the Directors of the Coupar-Angus Gas Company have just presented to Mr. Thomas Inches an elaborately-carved silver snuff-box, as a mark of regard on his retiring from the management of the works, after a faithful service of 22 years.

In order to be able to clear off a debt due to the bank, and other debts past due, the Gas and Water Committee of the Inverness Police Commission are about to ask for a Provisional Order for the purpose of increasing their borrowing powers.

At a meeting of the Kelso Police Commissioners, held last Monday, the report was under consideration which Mr. John Romans, C.E., prepared, several weeks since, at the request of the Paving Committee, on the leakage of gas from the street mains. At the termination of the discussion, the Chairman said that the recommendation in the report from the Paving Committee was that copies of Mr. Romans's report, submitted to the Board on the 22nd April last, and of the Committee's report, be sent to the Directors of the Gas Company; and that they be requested to make a thorough investigation into the state of their pipes, and renew or repair them where necessary. It was to their interest to see that leakages should be stopped. The report was thereafter declared adopted.

The Kirkintilloch Burgh Commissioners have arranged to borrow the sum of £16,000 for completing the purchase of the gas-works, and for the execution of further works, in terms of the Burghs Gas Supply (Scotland) Act. They have also resolved to continue the price of gas, for another year, at 5s. per 1000 cubic feet.

On Thursday last the transference of the works, plant, &c., of the Peterhead Gas Company to the Corporation became an accomplished fact. At a joint meeting of the interested parties held in the Royal Hotel, at which there were also present Mr. Smith, Gas Manager, Aberdeen, and Mr. M'Crae, Gas Manager, Dundee, the Arbiters, it was agreed to hand over the business to the Police Commissioners, who will pay £12,000 for the works, &c., the Gas Company discharging, of course, all their present liabilities, and collecting their own accounts. It is understood that the arbiters were quite satisfied with the fairness of the bargain.

From the minutes of the Corporation Gas Committee, read at a meeting of the Greenock Police Board, held last Tuesday, it transpired that the average illuminating power of the gas, as determined by 25 observations taken at the works, was 28·75 candles. While speaking of Greenock, I may also mention that the gas question was up for consideration at two of the municipal ward election meetings held during the past week. One of the Town Councillors spoke of the Gas Trust as being one of the most important and prosperous Trusts in the town, and referred to the fact that the sum of £4000 from the gas profits was paid into the funds of the Police Board. He considered that it was well for the gas supply to be in the hands of the Municipality, as, if it was in the hands of a private company, the ratepayers would have to pay the same price for their gas, and would not have the £4000 put into the municipal funds. Treasurer Blackmoor, a large employer of labour, urged that the incidence of taxation should be sustained by all in equal proportion. The inequality at present was so great that it was a difference of 60 per cent. to him; and he thought that "every herring should hang by its own tail." Another Councillor, in addressing his constituents, referred to the gas-works, and said that, by placing the electric light on a few of the steeples, they would be able to light up the whole of Greenock.

While addressing a meeting of the Glasgow Ninth Ward Electors a few nights since, Councillor Miller, formerly Convener of the Corporation Gas Committee, spoke on the gas question. Coming to the question of the gas, he said they were all aware that great fears were beginning to be entertained that a day might be approaching when some other system than that of gas would come into common use. The new system of lighting by electricity was already in operation in some parts of Paris and a few other places, but there were great obstacles to the adoption of the scheme generally. He believed electricity would yet be used for the lighting of public halls and factories, and he was told that one of the manufacturers in the city had either already introduced it, or intended to do so, into his factory as a means of lighting. But he did not think it would be generally used in dwelling-houses, and there would be great expense connected with the adoption of the scheme for the lighting of streets; so that, although they might be affected in the future, he did not think their gas system would be altogether ruined by the new system.

The offer recently made by the Falkirk Gas Company (now represented by Mr. M'Gilchrist, of Dumbarton, and other two gentlemen formerly mentioned) to purchase the works, &c., of the Falkirk Joint-Stock Gas Company, Limited, was considered at a meeting of the Shareholders of the latter held last Tuesday. The Chairman (ex-Provost Kier) and all the Directors of the Company, with one exception, were in favour of closing with the offer, while a majority of the Shareholders, not acquainted with the working of competing Gas Companies, decided against the proposal to sell the works. By way of showing that they were ready to do their duty to the gas consumers, the Falkirk Gas Company recently submitted to Provost Russel and Bailie Dick their willingness to enter into a contract to supply gas under any recent Act of Parliament in regard to purity, quality, pressure, &c., and at a price not higher than the average of any seven towns in Scotland, the gas supply of which was under corporation management. Surely such a bargain would be a good one for the gas consumers of Falkirk, who have long paid a much higher price for their gas than other towns similarly situated. One would naturally conclude that a gas monopoly, when regulated by such conditions, would be of the greatest advantage to the town. I should suppose that the new proprietors of the Falkirk Gas Company's works will not bind themselves to those conditions if they do not also get possession of the Joint-Stock Company's works. If anything like a favourable offer was made to them, the shareholders have surely made a mistake in not accepting it.

My budget of gas news is so full this week that I must hold over my water supply news items.

Although somewhat sharp, the fluctuations in the Glasgow pig iron market during the past week have been within small compass. A very large business has been done. An unreasonable rush was made on Tuesday down to 42s. 10½d., but the price soon rallied to 43s. 4d. On Friday afternoon business was transacted at 43s. 9d. to 44s. cash.

Coal is still a great drug in the market. Miners wages are in most cases reduced to from 2s. 6d. to 3s. 6d. per day.

PROPOSED REDUCTION IN THE PRICE OF GAS AT HEYWOOD.—A meeting of the Gas Commissioners of the Heywood Local Board was held last Thursday, when the question of a further reduction in the price of gas was under consideration. Mr. Chadwick moved, and Mr. Greenwood seconded a resolution, which was carried unanimously—"That the Local Board be recommended to further increase the discount allowed on all gas accounts paid within the month to 1s. 3d. per 1000 feet." The price per 1000 feet at present is 5s., subject to a discount of 10d. per 1000 feet if paid within the first month of the ensuing quarter. What the Committee now propose to do is to increase this discount to 1s. 3d. per 1000 feet, which will have the effect of reducing the price to consumers, within the Local Board district only, to 3s. 9d. per 1000 feet.

FYLDE WATER-WORKS COMPANY.—The twenty-eighth half-yearly meeting of this Company was held at Kirkham, on Thursday, the 10th inst.—Mr. H. L. Birley in the chair—when the following report was presented and adopted:—"The last statement submitted to the Stockholders showed the expenditure to be £185,864 12s., of which £7637 13s. 1d. was on account of the Grizedale reservoir extraordinary repairs and extra water supply. During the past six months £5209 9s. 11d. further has been expended on the general capital account, and £5933 6s. on the extraordinary repairs and water supply. On the revenue account the amount received during the half year ended the 31st of August last for water, &c., was £6972 17s., less interest on loans, commission, and working expenses (£2684 13s. 9d.), leaving a balance of £4288 3s. 3d. The receipts for water during the year just ended exceed by £892 those of the previous year; and the number of houses now supplied has increased from 6111 to 6604. The Directors recommend a dividend at the rate of 5 per cent. per annum, which will absorb about £3240, and leave a balance of revenue to be carried to the reserve-fund of about £1048. In June last, the Directors, in pursuance of the powers given to them, offered to the Stockholders £9450 of the unissued stock B, at a premium of 25 per cent. Of this, £8662 was accepted, and a premium of £2165 10s. received thereon. This premium the Directors have carried also to the general account, and have transferred to the same account, from the capital account, the reserve-fund of £4159 9s. 11d., and debited the general account with the total sum expended on the Grizedale extraordinary repairs and extra water supply. This latter sum has been increased during the past half year by £5933 6s., and now amounts to £13,570 19s. 1d., of which £9816 6s. 4d. has been expended in repairs, and £3754 12s. 9d. for the extra water supply. During the last half year £761 8s. has been paid on account of such supply. This outlay has induced the Directors to recommend a reduced dividend. When the Directors last reported, they hoped the leak at Grizedale had been discovered; but on testing the reservoir in August, it was found that such was not the case. The further works recommended by Mr. Barham Foster are now being proceeded with. The southern portion of the Barnacre reservoir has been used during the last summer, and the northern portion is now ready to have water turned into it. Mr. Foster, the Engineer, says they have endeavoured to find the site of the further escape of water; but time has not yet permitted them to do so. With the Barnacre reservoirs, both finished and available for holding water, he does not expect that next year there will be any expense or inconvenience in the extra water supply."

THE LIVERPOOL GAS COMPANY AND THE BURNING OF THE LANDING-STAGE.—The *Liverpool Courier*, of Tuesday last, says: "The dispute that has been pending for about four years between the Mersey Docks Board and the Liverpool Gas Company, respecting the compensation to be paid for the burning of the landing stage, is at length finally settled. It will be remembered that the claim of the Dock Board was tried at the Liverpool Summer Assizes in 1875, before Baron Huddleston and a special jury, and after a four days hearing, the jury found that the destruction of the stage arose through the negligence of the Gas Company's servant, and that the Company were therefore liable to make good the loss. The amount of compensation to be paid by the Gas Company was left to arbitration, and thereupon the contention arose whether the payment should be calculated upon the actual loss of the property destroyed or the cost of reinstating the stage according to the plans of the Engineer. Subsequently it was agreed between the parties that the Company should pay two-thirds of the estimated cost of reconstruction, which was put down at £120,000, and an arrangement was made that the payment should be spread over a period of three years. When, however, the reconstruction was completed, the cost was found to be £42,000 in excess of the original estimate, and it has been in respect of what proportion of this additional sum the Gas Company should bear that the dispute has since gone on. Under the arrangement alluded to, a sum of £70,000 was paid to the Dock Board, and with regard to the balance further due, it was decided to put the matter to reference, Mr. Edwards, Q.C., of the Northern Circuit, being chosen the arbitrator. The objection of the Company to pay any proportion of the £42,000 was grounded on the allegation that the stage had been reconstructed in a more elaborate and expensive manner than the one which was burnt. The arbitration was fixed for yesterday, but eventually was postponed, and yesterday the Dock Board had a meeting to consider an offer of the Gas Company to settle the matter amicably. After a lengthy discussion, it was agreed to come to terms with the Company, the sum to be accepted as a final settlement being £17,500. This will make the total payment to the Board £87,500, or rather more than one-half of the amount expended in reconstructing the stage, with additions and improvements which did not exist in the previous one."

Register of New Patents.

3134.—BORRADAILE, T. S., Union Court, Old Broad Street, London, "*Improvements in the construction of apparatus for regulating the consumption of gas.*" A communication. Patent dated Aug. 17, 1877.

The object of this invention is to enable the consumption of gas by a burner to be either varied or kept at a fixed rate, without the necessity of taking the apparatus to pieces in order to adjust it.

To this end there is fixed on the gas-pipe a cylindrical cup or vessel, and within the cup or vessel is fitted hermetically a hollow cylinder surmounted by a cap, with which the burner of the lamp may be directly or indirectly connected.

Within the hollow cylinder a fixed horizontal diaphragm or partition, as well as a moveable disc, fitting easily to the sides of the cylinder, is provided, and surmounted by a short tube which slides up and down a circular aperture in the centre of the fixed diaphragm. In the sides of the cup some grooves are made, and in the sides of the hollow cylinder and of the short tube, suitable apertures or orifices are provided for the passage of the gas. These grooves or orifices are arranged in such a manner that on turning the hollow cylinder round within the cup, which may be done by means of a handle or otherwise, the open space for the passage of the gas is either enlarged or reduced.

Upon the edge of the cup a scale is marked or inscribed, denoting the units of the consumption of gas by the burner, and on the edge of the hollow cylinder opposite thereto, one or more corresponding marks are made, so that by making the cylinder perform part of a revolution, the quantity of gas to be consumed is adjusted, which being done, the cylinder may be fixed in its position by means of one or more screws, or by any other suitable appliance. A vernier may be applied to the scale upon the edge of the cup or of the cylinder in those cases in which diminutive quantities of gas are to be denoted.

Within the hollow cylinder the sides of the short tube are perforated, in such a way that the gas that enters the short tube, through the holes in the sides thereof, is conveyed to the burner through apertures made in the top of the hollow cylinder. By this means, the more the pressure of the gas rises, the more the disc will be raised, and the narrower will become the space between the edge of the short tube and the top of the hollow cylinder; or, in other words, the greater the pressure, the less gas will be conveyed to the burner, and the quantity of gas reaching the burner will be in inverse ratio to the pressure in the main.

If the moveable disc does not fit tight against the sides of the hollow cylinder, a small flame may be permanently kept up on the burner, and enlarged to the requisite size by turning the hollow cylinder before described.

In order to prevent clogging, and yet give the moveable disc sufficient guidance, it is preferred in some cases to provide a number of projections upon the circumference of the disc.

If the consumption of the gas is to remain invariable in each lamp to which the regulator is applied, the hollow cylinder is screwed upon a base fixed on the gas-pipe. In this event the moveable disc and the short tube are perforated in such a manner that an identical quantity of gas is conveyed above the diaphragm at all pressures, and a fixity of consumption thus achieved.

If it be required to vary the consumption of gas, one of the holes in the disc may be closed by a screw, a lateral portion of which has been removed so as to allow the gas to pass through the segmental opening formed thereby. The nearer the flat head of the screw approaches the disc, the less gas will pass through, until the flat head reaches the disc and closes the aperture.

The cup and hollow cylinder arrangement, according to this invention, may also be adapted to other constructions of gas-regulators for the purpose of varying the quantity of gas to be consumed, according to the varying circumstances of the case.

The same object may be achieved by applying a rod, with one or more segments removed, or hollows cut and passing diametrically through the hollow cylinder, in such a way that the orifices within the sides thereof may be opened by placing the flat or hollow side of the rod opposite them by turning the knob fixed at one end of the rod.

The same object may likewise be achieved by fitting only the upper part of the hollow cylinder into the cup, and leaving sufficient space between the lower part of the cylinder and the cup to allow of the gas passing between them to one or more apertures leading into the interior of the cylinder above the disc.

By raising or lowering the cylinder within the cup, which may be done by screwing it into the cup in such a manner that by merely turning it, it is made to rise or descend, the quantity of gas passing between the lower edge of the cylinder and the bottom of the cup is increased or reduced, and no gas at all is allowed to pass if the cylinder is so far screwed down that its edge touches the bottom of the cup.

3199.—SUTCLIFFE, H. and W., Halifax, "*Improvements in water-taps.*" Provisional protection only obtained. Dated Aug. 23, 1877.

This invention has for its object apparatus to be used in conjunction with a construction of water-tap whereby the latter may be repaired when under pressure—that is to say, without turning off the water at the main.

According to one construction of tap, there is an enlarged cavity under the valve, within which is an india-rubber ball forced through the hole in the valve-seat. The ball is held clear of its seating by a cavity at the end of the under spindle of the valve until, for purpose of re-washering or repairing the tap, its valve is removed, whereon the pressure of water forces the elastic ball upwards on its seating, closing the water-passage way.

According to a second construction, there is connected to the under side of the tap (by thread or screwing) a tube or receptacle for a short cylinder of india-rubber, gutta-percha, or other buoyant and elastic substance. The tube and cylinder are directly under the passage way of the water from the service-pipe to the exit way at the mouth of the tap. The valve of the tap is provided at its under side with a short spindle, which serves at all times (save when the tap is under repair) to prevent the cylinder being by pressure of water forced upwards and closing the passage way—that is to say, whether the tap be open (in use) or shut (not in use) the spindle and cylinder are in contact. When, however, for the purpose of re-washering or repairing the tap, its stuffing-box and the valve are removed, there being no longer any obstruction to the further movement of the cylinder, the latter is by the pressure of water forced upon and against the water-passage way, a seat being provided for the head of the cylinder, which at once closes and seals the water way until the replacement of the valve and stuffing-box, whereon the spindle of the valve forces and holds the cylinder clear of the passage way until the valve is again removed.

As a modification of this invention, an elastic ring or elastic seating may be employed in conjunction with a screw cap and glass, or other non-elastic ball or cylinder, the under spindle of the valve holding the glass or non-elastic ball or cylinder clear of its seating until, for repairs, the stuffing-box and valve are removed.

3311.—MARRIOTT, W., Huddersfield, "*An improved process or method of purifying gas.*" Patent dated Aug. 30, 1877.

The object of this invention is the removal or separation from gas of those sulphur compounds generally known as "other sulphur compounds," which are not separated or eliminated from the gas by the methods or processes in use for the separation or removal of sulphuretted hydrogen. The nature or character of these "other sulphur compounds" is not positively known or clearly defined, but their presence in the gas has a deleterious influence or effect, and therefore their removal is desirable.

The only practicable process now in use, the inventor says, to reduce these indefinite sulphur compounds to the prescribed quantity or proportion is that in which the gas is passed through foul lime—that is to say, lime containing sulphide of calcium. This process partially reduces them, but the removal of the foul lime necessary for this purpose is a great nuisance in the neighbourhood of the gas-works, and adds considerably to the cost of purification. By this process the purification of the gas is effected without creating any nuisance, a greater portion of the sulphur compounds other than sulphuretted hydrogen—namely, the so-called "other sulphur compounds"—is separated or eliminated therefrom than has heretofore been practicable. For this purpose a solution or solutions made as follows are used—that is to say, any of the alkalies, such as soda, potash, or ammonia, or the alkaline earths, such as lime, magnesia, or baryta, or the sulphides of sodium, potassium, ammonia, calcium, magnesium, or barium, are converted into polysulphides by boiling them in water with an excess of sulphur until all the alkali or alkaline earth is dissolved, and sulphur alone remains.

The inventor wishes it understood that he uses the name polysulphides

to indicate all those soluble sulphides which contain more equivalents of sulphur than of the base combined therewith.

As some of these substances are more costly than others, and as the treatment of some of them in the apparatus now in use in gas-works would be attended with practical difficulties, preference is given to soda or sulphide of sodium as being the least difficult in its manipulation in scrubbing the gas. In the following description of the process the patentee has specified the use of caustic soda or sulphide of sodium, but the same process may be carried into effect with any of the other above-named substances, and by the employment of the same apparatus. He uses a cylindrical boiler, arranged horizontally, and having a shaft extending centrally throughout its length. To this shaft arms are attached to keep the materials in the boiler well agitated. The boiler may either be heated directly by a fire or by high-pressure steam.

The apparatus may be made of any suitable and convenient size and shape. The boiler is filled about half full of water, and when the water boils, the caustic soda or sulphide of sodium is introduced. When these are dissolved and the solution stands when hot at 15° by Twaddel's hydrometer, sulphur, so broken up as not to impede the agitator, is added, and the boiling continued as long as any sulphur will dissolve, leaving an excess of sulphur. The solution is then allowed to settle, and when cold is ready for use.

The solution so prepared, and which is termed polysulphide solution, stands when cold at about 23° Twaddel, but the patentee does not confine himself to any particular or precise strength of this solution, as he has found by experiment that the same may be increased or diminished, according to the strength of the sulphur compounds and carbonic acid. He uses this solution for scrubbing the crude gas in the same manner and in the same apparatus as now used in gas-works to separate the ammonia from coal gas.

Crude gas contains, in addition to the illuminating gas, sulphuretted hydrogen, carbonic acid, ammonia, and bisulphide of carbon, the latter constituting the chief element of what are generally called "other sulphur compounds." When carbonic acid comes in contact with the polysulphide solution, it combines with the alkaline base, forming with soda, potash, or ammonia, soluble carbonates; and with lime, magnesia, or baryta, insoluble carbonates. These latter are precipitated along with the sulphur forming the polysulphide. Not only is the polysulphide solution converted by the crude coal gas into a carbonate, and sulphur deposited, but there is also formed in the solution a considerable quantity of sulphocyanide, when ammonia is present in the gas; but the polysulphide solution will remove the "other sulphur compounds" if all the ammonia be previously removed from the gas.

When any quantity of the polysulphide solution becomes exhausted, or ceases to remove the "other sulphur compounds" from the coal gas, it is drawn off, and a fresh quantity of the solution is supplied in its place, so that this operation will be continuous with very slight cost for labour. If this polysulphide solution is made from sulphide of sodium, the exhausted solution consists principally of carbonate of soda, sulphocyanide of ammonia, and suspended sulphur. All of these substances may be recovered by any of the well-known means. The sulphur which settles after being thrown on a filter may be used again to form the polysulphide solution.

When caustic soda is used to make the polysulphide solution, one-half of the soda is converted into hyposulphite of soda, and this will be found in the exhausted solution with the carbonates and sulphocyanides.

By using the polysulphides for separating the "other sulphur compounds" and carbonic acid from coal gas, all nuisance is avoided, and the employment of lime may be altogether dispensed with, oxide of iron alone being made to separate the sulphuretted hydrogen.

3330.—Foulis, W., Glasgow, "*New or improved apparatus for lighting and extinguishing gas-lamps, part or parts thereof acting as governors for lamps or for analogous purposes.*" Patent dated Sept. 1, 1877.

This invention relates to that class of gas lighting and extinguishing apparatus which has for its object the lighting or extinguishing of a number of gas-lamps, such as those in a street or district, simultaneously, the apparatus accordingly, as it is constructed, acting wholly or partly as a gas-governor.

The apparatus consists, under one form, of a chamber situated near the burner of each lamp. This chamber is partially filled with liquid, such as glycerine or oil. In this chamber is a bell, the lower part of which dips into the liquid, and has attached to its top a valve which, when shut, closes communication between the gas-main and the burner, and, when open, establishes that communication. The interior of the bell communicates by a pipe with a vessel in which the pressure of air or gas is regulated from time to time as required, the vessel being situated at the gas-works or any other convenient place, and having pipes leading from it to all the lamps which are to be simultaneously lighted and extinguished. Attached to another chamber, situated above that already described, is a small burner, which may be called the "pilot burner," provided with a shield to prevent the flame of it from being blown out. This pilot burner is in constant communication with the gas-mains by means of a fine groove or small orifice formed in another valve carried in a seat beneath the pilot burner, and by preference immediately above the valve on the bell. The small orifice may, however, be formed in the valve-seat or in any other situation capable of communication with the pilot burner. The angle at which the pilot burner is placed is such as to direct its flame towards the large or main burner.

When the lamps of the street, district, or building are not lighted, a small quantity of gas continuously flows to the pilot burner of each lamp through a pipe from the mains, and is kept continuously burning.

When it is desired to light the main burners of the lamps, the pressure of the air or gas inside the bell is increased until it is slightly greater than the pressure of the gas in the main, *plus* the weight of the bell and its connections. The bell is thus caused to rise and open the valve attached to its upper end, whereby communication between the gas-mains and the main burners is established.

The pressure inside the bell being greater than the pressure of gas on its top, the bell will continue to rise until the valve comes in contact with the stem of the other valve immediately below the pilot burner, which valve being thereby also opened, allows a greater quantity of gas to pass to the pilot burner. This increased supply of gas to the pilot burner produces an instantaneous elongation of its flame, which is thus caused to reach up to and ignite the gas issuing from the main burner. The pressure of air or gas inside the bell is then reduced to an amount which, whilst allowing the bell to be depressed to some extent, will still maintain the valve on its top open to the degree required for the passage of a proper supply of gas to the main burner, the falling or depression of the bell being sufficient to allow the small valve of the pilot burner to close, thereby reducing the flame from the pilot burner to its normal condition.

The apparatus also acts as a governor by the pressure inside the bell regulating at all times the extent of opening of the valve attached to its top, and therefore the flow and pressure of gas outside the bell, so that by increasing or diminishing the pressure inside the bell, the pressure of gas, and therefore the size of flame at the main burner, are increased or diminished proportionately, and the apparatus may be constructed without the lighting and extinguishing arrangements, in which case, being a governor only, its movements may be regulated by a counterweight acting oppositely to the pressure of the gas.

Under another form of the apparatus, in place of using a bell to regulate the valve, either of the lamp lighting or extinguishing apparatus, or that of the governor, a flexible diaphragm may be employed, and the apparatus may be made of any required dimensions, so as to regulate the flow of gas to one, two, or more burners.

3364.—Johnson, J. H., Lincoln's Inn Fields, London, "*Improvements in liquid-meters.*" Patent dated Sept. 4, 1877.

This invention relates to that class of meters for water and other liquids which are known as pallet-wheel or turbine meters, and has for its object the production of a meter which shall fulfil the following conditions:—

1. Accuracy in registering the volume of water (for example) which passes through it.
2. Sensitiveness, even at the lowest speed of the flow of water.
3. Non-liability to be affected by the disturbing influence of the backward thrust of the water on a sudden closing of the outlet.
4. Protection against the injurious action of sand, rust, or other solid substances contained in the water upon the working parts.

These results are attained by the construction and arrangement of a meter, which is not described apart from the drawings.

APPLICATIONS FOR LETTERS PATENT.

3988.—Fox, St. G. L., Telegraph Street, London, "Improvements in obtaining light by electricity, and in conveying, distributing, measuring, and regulating the electric current for the same, and in the means or apparatus employed therein." Oct. 9, 1878.

3991.—Clark, J., Kensington, London, "A new or improved method of adapting the electric light to domestic and other ordinary purposes." Oct. 9, 1878.

3994.—Hopper, G. C., Southampton Buildings, London, "Improvements in wrenches." A communication. (Complete specification.) Oct. 9, 1878.

3997.—Dowson, J. E., Claverton Street, London, "Improvements in apparatus for the manufacture of gas." Oct. 10, 1878.

3999.—Goodson, H. E. T., Fulham Road, London, "Improvements in pressure-reducing valves for gas, steam, or water pipes." Oct. 10, 1878.

4003.—M'Dougall, A., Penrith, and Hepworth, J., Carlisle, Cumberland, "Improvements in the purification of gas, and separation of products therefrom." Oct. 10, 1878.

4005.—Stewart, A. and C., Glasgow, "Improvements in pressure-gauges." Oct. 10, 1878.

4006.—Jensen, P., Chancery Lane, London, "Improvements in electric lighting apparatus." A communication. Oct. 10, 1878.

4016.—Munro, J., West Croydon, Surrey, "Improvements in electric lighting," &c. Oct. 11, 1878.

4022.—Cadett, J. W. T., Camberwell Grove, London, "Improved arrangements for electric lighting." Oct. 11, 1878.

4031.—Clark, A. M., Chancery Lane, London, "Improved means of softening or diffusing the electric and other light." A communication. Oct. 11, 1878.

4043.—Fox, St. G. L., Telegraph Street, London, "Improvements in the application of electricity to lighting and heating purposes, and in the means or apparatus employed therein." Oct. 12, 1878.

4046.—Harding, G. P., Paris, "Improvements in obtaining electric light." Oct. 12, 1878.

4047.—Harding, G. P., Paris, "Improvements in obtaining electric light." Oct. 12, 1878.

4074.—Arnaud, A., Blackfriars Road, London, "A mode of indefinitely dividing electric currents." Oct. 14, 1878.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1504.—Wanklyn, J. A., and Cooper, W. J., Westminster, "Improvements in the method of determining organic matters contained in solutions." April 15, 1878.

1534.—Cockey, H. and F. C., Frome Selwood, Somerset, "Improvements in wooden grids for gas purifiers." April 17, 1878.

1687.—Clark, A. M., Chancery Lane, London, "An improved pump." A communication. April 26, 1878.

2095.—Clark, A. M., Chancery Lane, London, "An improved apparatus and process for manufacturing illuminating gas." A communication. May 24, 1878.

2686.—Cowan, W., Edinburgh, "An apparatus for automatically varying the load and pressure in gas-governors." July 5, 1878.

2704.—Smethurst, J., Clifton, Lancs, "Improvements in arrangements and apparatus for treating smoke, gases, vapours, and noxious gaseous discharges from fires, furnaces, chemical, sewage, manure, and other works or manufactories, and utilizing the products therefrom, parts of which improvements are also applicable to the manufacture of gas, and for cooling and purifying air for ventilating buildings and mines." July 6, 1878.

2873.—Sturgeon, T., Horsforth, Yorks, "Improvements in machinery for compressing air or other gaseous fluids, and also for exhausting the same." July 18, 1878.

3322.—Bodart, A., Rue Neuve, Belgium, "Improvements in joints for pipes or tubes." Aug. 23, 1878.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

3205.—Spencer, W. H., "Improvements in the manufacture of illuminating gas." Sept. 13, 1875.

3220.—Whitaker, J. W., "Improvements in apparatus for charging gas-retorts." Sept. 15, 1875.

3221.—Crossley, F. W. and W. J., "Improvements in gas motor engines." Sept. 15, 1875.

3247.—Fleury, F. G., "Improvements in water-meters or apparatus for measuring the flow of liquids or fluids." Sept. 17, 1875.

3254.—Morgan-Brown, W., "Improvements in the manufacture of ammoniacal salts." Sept. 17, 1875.

3267.—Turner, S., jun., J., and R., "Improved means for securing the joints of steam and water pipes, and for other similar purposes." Sept. 18, 1875.

3301.—Weston, F., "Improvements in apparatus connected with increasing the illuminating power of coal gas." Sept. 21, 1875.

3398.—Walker, W. T., "An improved gas-testing cock." Sept. 30, 1875.

3411.—Bourry, E. A., "Improvements in joining or connecting pipes to each other, or to plane or curved surfaces." Oct. 1, 1875.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2626.—Ellis, W. I., "Improvements in machinery for forcing and exhausting air or other gases." Oct. 4, 1871.

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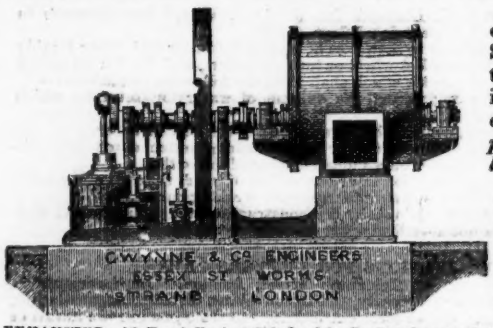

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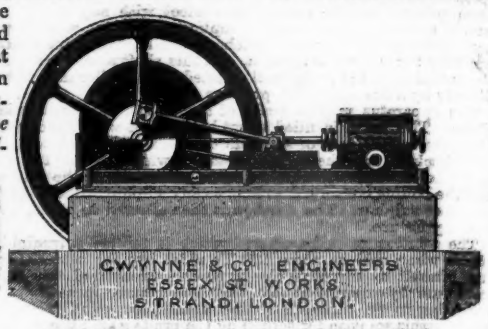

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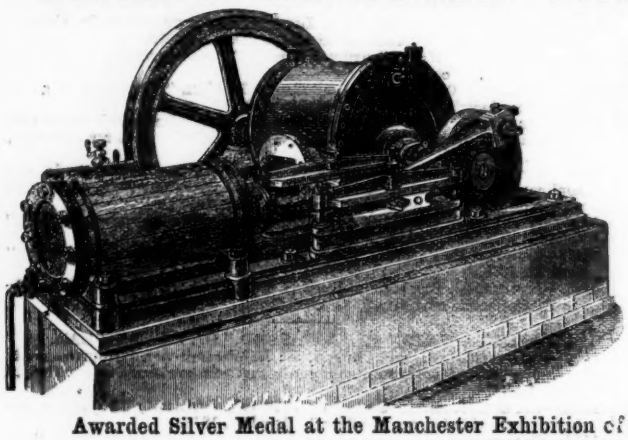

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John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

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WANTED, a General Manager for the Barrow-in-Furness Gas and Water Works. Applicants must thoroughly understand the management of both Gas and Water Works. Salary, £300 a year, with house, coal, gas, water, and rates; subject to a moderate increase in the event of satisfactory and efficient services.
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Canvassing of the Members of the Council will be considered a disqualification.
By order,
C. F. PRESTON, Town Clerk.
Municipal Offices, Oct. 19, 1878.

THE Advertiser, just returned from a foreign engagement, seeks one similar as Repairer and Tester of wet and dry Meters, Main Layer, with all pertaining to the Distributory Plant. Testimonials.
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A Thoroughly qualified Assistant is required at once for the Engineer's Office at these Works. He should have good experience in the preparation of plans and estimates requisite for the extensions of both Gas and Water Works, Levelling, Surveying, &c.
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Gas-Works, Widnes, Oct. 9, 1878.

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THE Directors of the Red Hill Gas Com-pany are prepared to receive TENDERS for the Surplus TAR and AMMONIACAL LIQUOR produced at their Works for One, Two, or Three years, from Jan. 1, 1879, or such other term as may be agreed upon.
Particulars, respecting quantity, &c., may be had on application to the Manager, at the Gas-Works, Red Hill, Surrey.
Tenders to be delivered, or sent so as to be received at the Gas-Works, not later than Saturday, the 2nd day of November next, endorsed "Tender for Surplus Tar and Ammoniacal Liquor."
By order of the Board,
C. READ, Manager and Secretary.
Gas Office, Brighton Road, Red Hill,
Surrey, Oct. 17, 1878.

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THE Gas Committee of the Rochdale Corporation offer for SALE a STATION-METER, capacity 25,000 cubic feet per hour, 12-in. Connections, Hydraulic Valves, and Bye-Pass, and all other necessary fittings. The Meter to be removed in consequence of extensions.
Any further information thereon can be had from the Manager at the Works.
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Forms of tender, on which offers must be made, may be had, and further particulars obtained, on application to the Manager, at the Gas Office, 42, Virginia Street, Glasgow; and offers, endorsed "Tender for Residual Products," will be received by the subscriber up till Saturday, the 26th of October next.
Suitable ground for the erection of Chemical Works may be acquired in the immediate neighbourhood of the Gas-Works.
The Corporation do not bind themselves to accept the highest or any tender.
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City Chambers, Glasgow, Sept. 3, 1878.

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Westminster, S.W.
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THE Electric Arc among the Gas Shares. See *Nature* for the 10th of October, post free for seven stamps.
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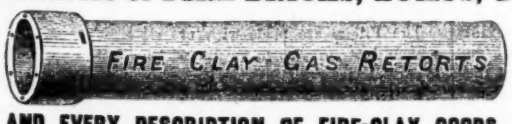

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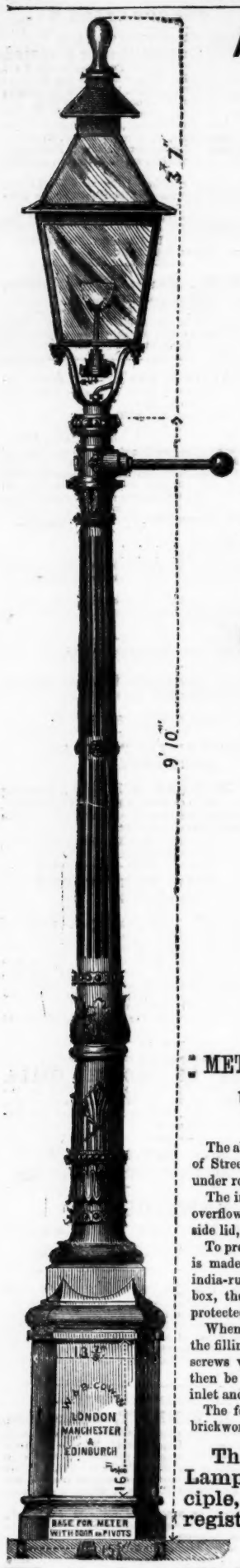
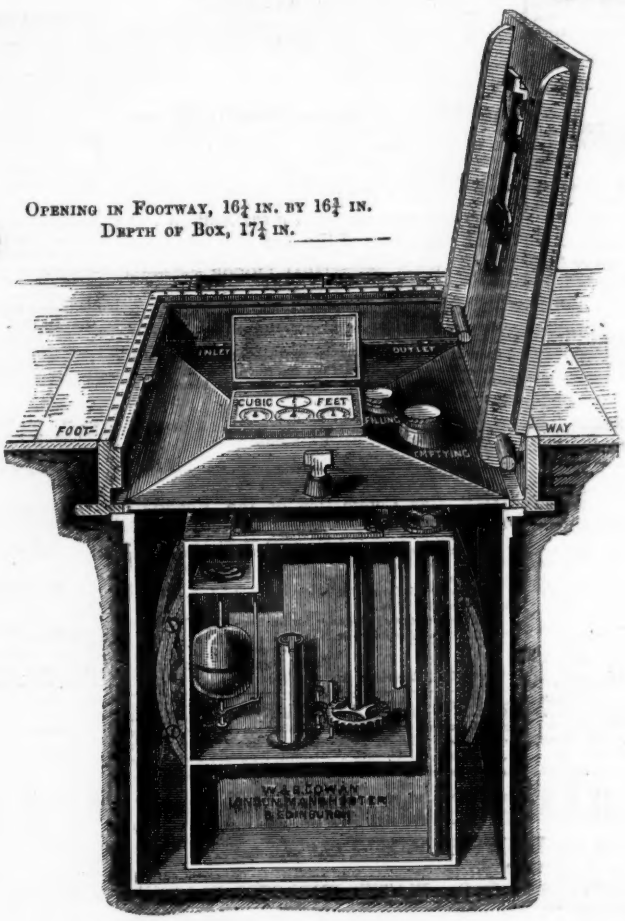


OPENING IN FOOTWAY, 16¼ IN. BY 16¼ IN.
DEPTH OF BOX, 17¼ IN.



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The base of the Lamp-Pillar is but slightly increased in size to hold the Meter, and all danger of freezing is removed by charging the latter with 3-5ths water and 2-5ths glycerine, instead of water only.

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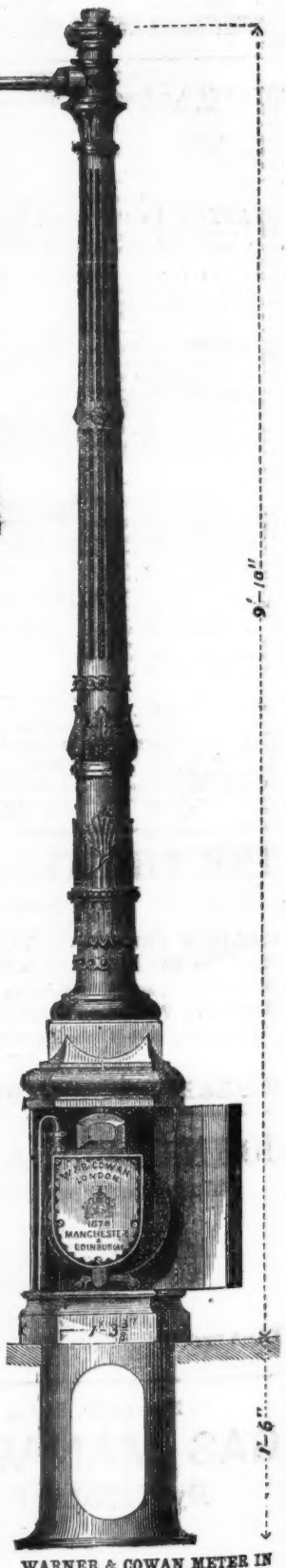

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"I have examined some of the deposits of iron ore in the following localities in the county of Donegal, over which Messrs. Cooke Brothers hold exclusive royalties for raising the ore—namely, several townlands in the Barony of Kilmacrenan, including the estate of Viscount Southwell, in the Barony of Raphoe, the estates of Sir Samuel Hayes and Colonel Montgomery, in the Barony of Ennishowen, several townlands on the estate of Mr. Newton—and I certify that the several estates are rich in Oxide; that the ore is of a very good quality, such as is usually shipped from this county; that the districts, which are very extensive, are capable of producing a large supply; in fact, the supply of ore on these estates is practically inexhaustible.

(Signed) "PHILIP M'LAUGHLIN, *Assistant County Surveyor.*"

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COMMERCIAL GLASS WORKS, 27, WELLCLOSE SQUARE, LONDON, E.

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Screw Stocks, Taps and Dies, Tube Wrenches,
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Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

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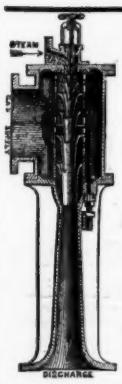

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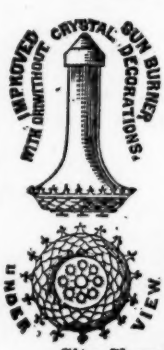

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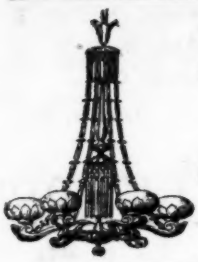

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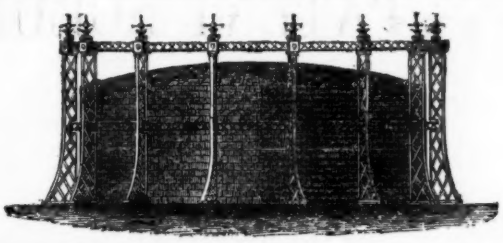

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MANN & OWENS' PATENT GAS-VALVE.

VALVE, with Indicator or Above Ground.

EVERY VALVE WARRANTED TO BE PERFECTLY SOUND AND GAS-TIGHT.

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The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

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Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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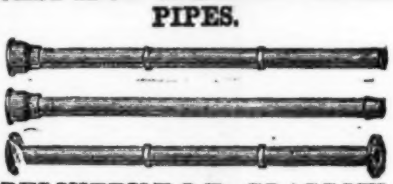

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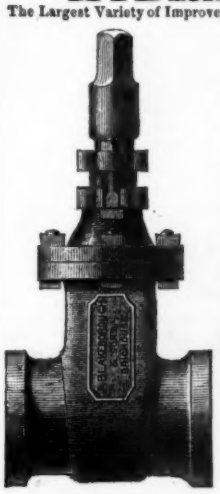

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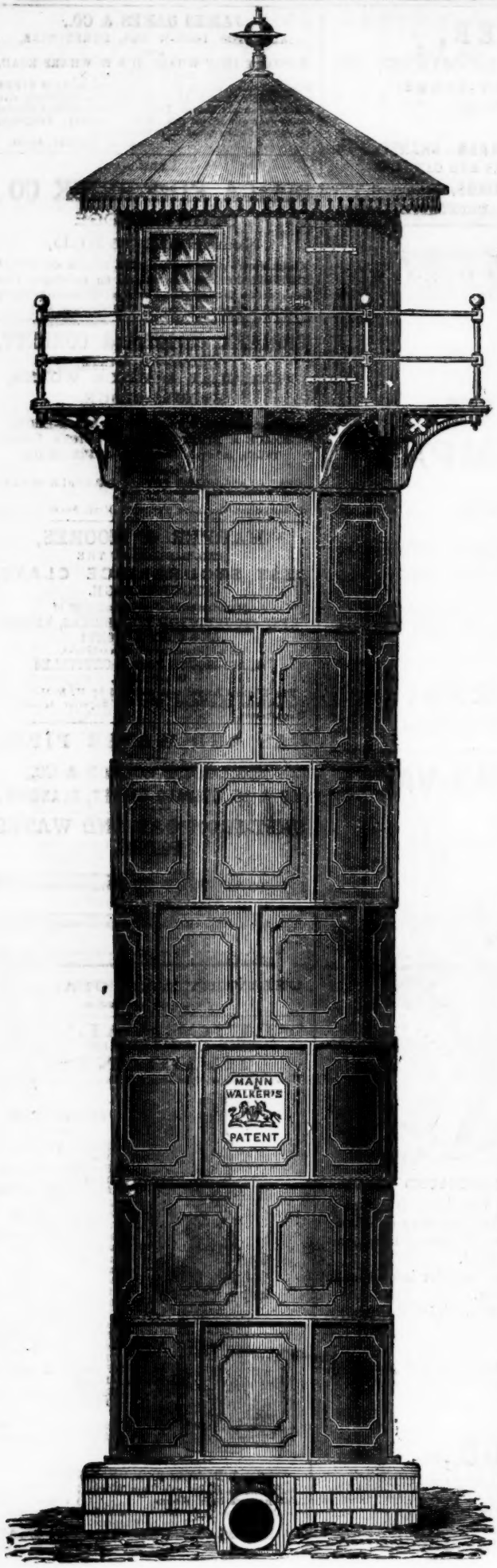
MANN & WALKERS' PATENT SCRUBBER.



By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

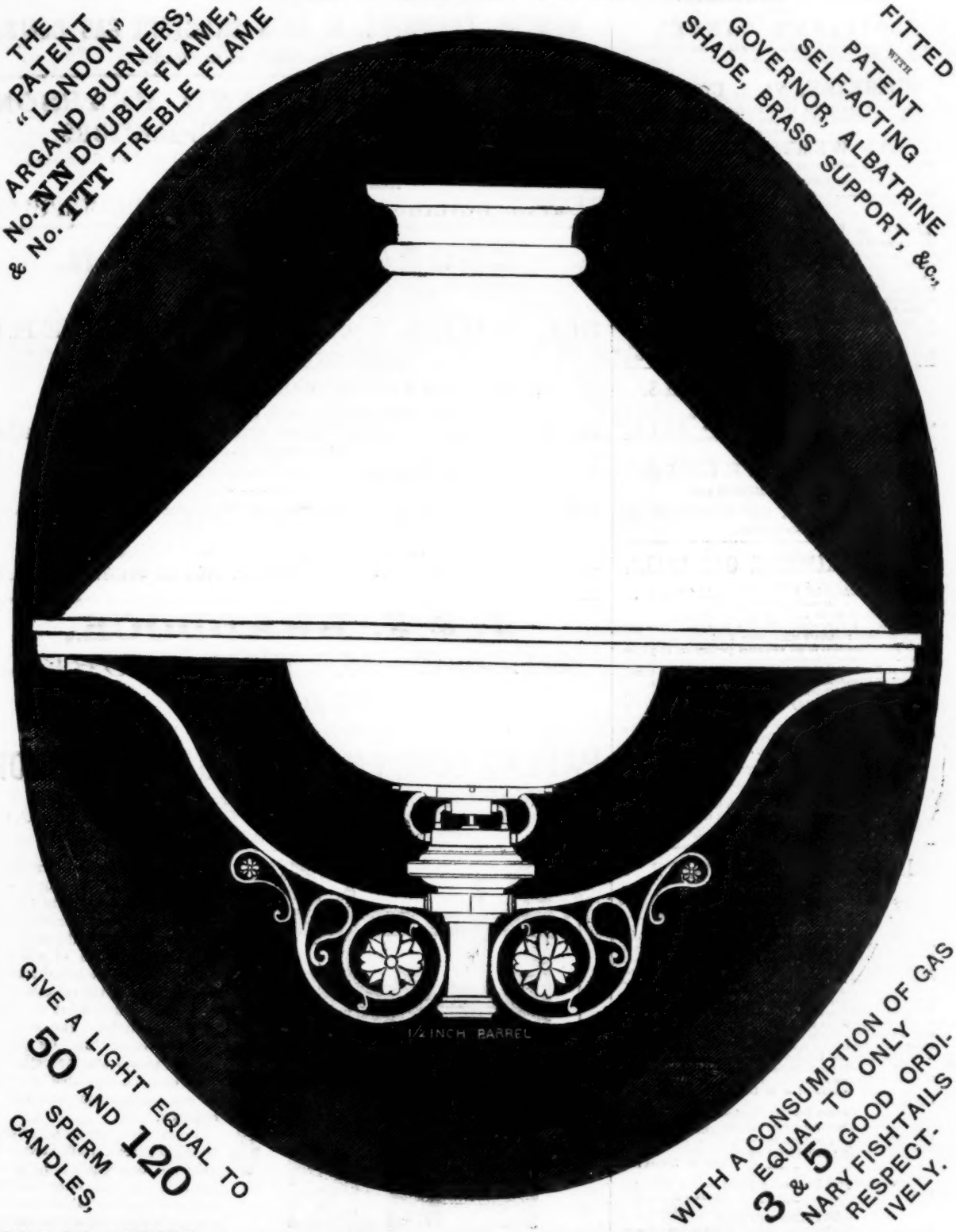
Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

POWERFUL LIGHT CENTRE.

NEAREST APPROACH TO DAYLIGHT.

THE PATENT "LONDON" ARGAND BURNERS, No. **NN** DOUBLE FLAME, & No. **TTT** TREBLE FLAME

FITTED WITH PATENT SELF-ACTING GOVERNOR, ALBATRINE SHADE, BRASS SUPPORT, &c.,



GIVE A LIGHT EQUAL TO **50** AND **120** SPERM CANDLES,

WITH A CONSUMPTION OF GAS EQUAL TO ONLY **3** & **5** GOOD ORDINARY FISHTAILS RESPECTIVELY.

PILLAR LIGHT, fitted with either No. NN or TTT Patent "London" Argand Burner,

May be also fitted as a SUSPENSION LIGHT for Large Rooms.

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LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

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Established 1840.

DEAN'S PRIMROSE GAS COALS.

South Metropolitan Gaslight and Coke Company, London, July 12, 1878.

The Owners of the Dean's Primrose Colliery.

Dear Sirs,—I have much pleasure in stating that this Company have regularly used your Coals for more than thirty years, and that in all essential particulars they give the most satisfactory results.

The yield of Gas is from 9700 to 9800 feet per ton, of full 16 candles illuminating power, tested by the London Referees Standard Burner; and the Coke is of very good quality, while the quantity is about 40 bushels to the ton of Coal.

I consider Dean's Primrose Coals to rank amongst the first-class Gas Coals from the Durham Coal-Field.

Yours truly, GEORGE LIVESEY.

These Coals are also used by The Gaslight and Coke Company (London), and other English and Foreign Gas Companies.

Steamers loaded with quick despatch in the River Tyne. Price and other terms on application at the

FITTING OFFICE, NEWCASTLE-ON-TYNE.

HOLMSIDE GAS COALS.

South Metropolitan Gaslight and Coke Company, 589, Old Kent Road, London, S.E., Oct. 9, 1873.

At the request of Mr. Hedley, the owner of the Holmside Colliery, I have much pleasure in stating that, for about ten or twelve years past, this Company has taken at least half of its supply of Newcastle Coal from him. I can, therefore, confidently bear testimony to the good quality of the Holmside Coals, and consider they are equal to the best of the Newcastle Coals, in proof of which I may state that this year we are using those Coals exclusively, that the yield of Gas is from 9700 to 9800 feet per ton, and that the quality of the Gas, without any admixture of Cannel, is over 16 candles, as tested by the officer appointed by the Metropolitan Board of Works, using the London Gas Referees test.

The Coke is of excellent quality, and in quantity amounts to about 40 bushels from a ton of Coal.

The annual consumption of Coal amounts to about 75,000 tons.

GEORGE LIVESEY, Engineer and Secretary.

P.S.—I am at this date, Feb. 15, 1875, still using Holmside Coals as largely as ever, and am quite as well pleased with them as when I gave the above certificate.

GEORGE LIVESEY.

We are this year, 1878, using 80,000 tons of Holmside Coal. GEORGE LIVESEY.

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M. BREMOND'S NAPHTHALINE PROCESS.

All negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.

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AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

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Analyses and Quotations on application.

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Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

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RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

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J. & J. BRADDOCK,

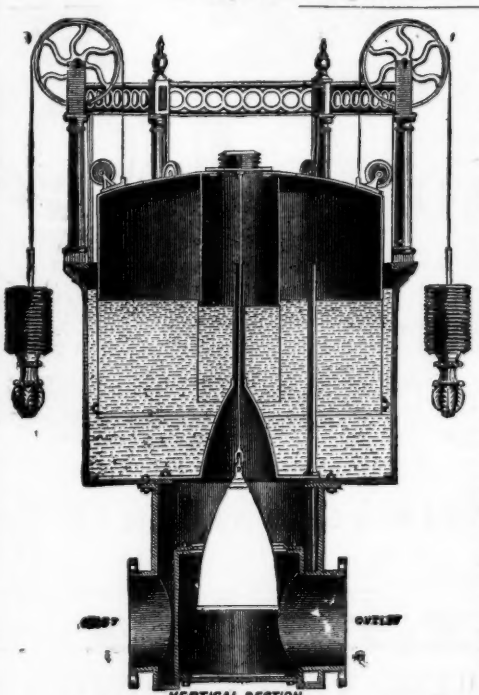
GLOBE METER-WORKS,

OLDHAM,

Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12.240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

RICH. H. TAUNTON & HAYWARD,

MANUFACTURERS OF

WROUGHT-IRON GAS, WATER, & STEAM TUBES & FITTINGS,

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SULPHATE AMMONIA.

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60, MARK LANE, LONDON, E.C.,

Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

PLANT ERECTED ON THE LATEST AND MOST APPROVED PRINCIPLE.

AGENTS to THE GASLIGHT AND COKE COMPANY, LONDON, for the SALE of SULPHATE AMMONIA. Works: BECKTON.

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MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

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Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

"Warrington Gaslight and Coke Company,
Offices, Mersey Street, Warrington, April 23, 1877.

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly, "JAMES PATERSON."

Full particulars will be sent on application to us—address as above.

NEW PATENT WET GAS-METER,

THE "RELIANCE,"

MANUFACTURED BY THE

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

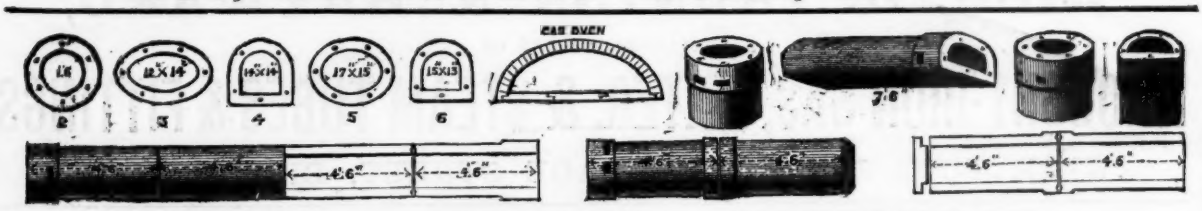
The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON.



HARRIS & PEARSON, STOURBRIDGE,

Proprietors of Best Clay Mines. Largest makers in the World of Gas-Retorts, Lumps, Tiles, Fire-Bricks, and Fire-Clay Goods of all kinds. 200,000 feet of Gas-Retorts of all Sizes and Patterns in Stock, all in good order. Orders for any Size executed on receipt.

CAST-IRON GAS AND WATER PIPES,

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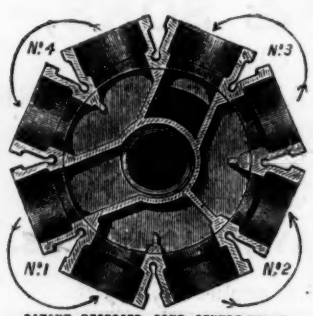

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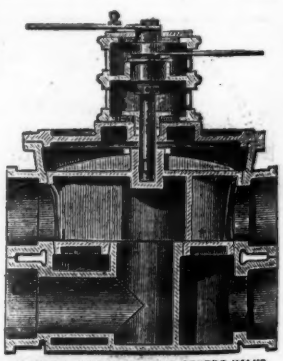

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